KNOWLEDGE, ATTITUDES, AND PRACTICES ON ANTIMICROBIAL RESISTANCE IN PUNE: A CROSS-SECTIONAL STUDY

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by

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Under the Supervision and Guidance of

Dr. Akshay Kumar Mishra

2025

IIHMR UNIVERSITY

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Atharva Rajaram Suryawanshi** in partial fulfillment of the requirements for the award of the degree of MBA (Pharmaceutical Management) from the IIHMR University, Jaipur has successfully completed his dissertation under my guidance during Mar 10 – May 31, 2025.

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CERTIFICATE

This is to certify that the dissertation titled "**KNOWLEDGE, ATTITUDES AND PRACTICES ON ANTIMICROBIAL RESISTANCE IN PUNE: A CROSS SECTIONAL STUDY**" is a record of the research work undertaken by **Atharva Rajaram Suryawanshi** in partial fulfilment of the requirements for the award of the degree of MBA (Pharmaceutical Management) from the IIHMR University, Jaipur under my guidance and supervision and his approach to the research study has been sincere, scientific and analytical.

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School Dean: **Dr. Saurabh Kumar Banerjee**

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DECLARATION BY STUDENT

I hereby declare that this dissertation titled "Knowledge, Attitudes, and Practices on AMR in Pune: A Cross-Sectional Study" is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

ARSuryawanshi

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Date:
17/06/2025

KNOWLEDGE, ATTITUDES, AND PRACTICES ON ANTIMICROBIAL RESISTANCE IN PUNE: A CROSS-SECTIONAL STUDY

Abstract

Antimicrobial resistance is a dangerous public health threat of the 21st century, driven largely by the misuse and overuse of antibiotics in both human and veterinary medicine. The WHO says AMR not only increases the risk of treatment failure and death but also endangers the sustainability of modern medicine.[1] In India, easy access to antibiotics, coupled with a lack of public understanding, contributes greatly to the coming AMR tsunami.[2]

The study's main goal is to evaluate how much the general public in Pune, Maharashtra knows, believes, and practices in regard to AMR. To assess this, we administered a questionnaire to a large number of people across Pune and then analyzed the responses we received. Some of the additional, specific goals we had while conducting this study were as follows:

1. Identify the sources from which the people in Pune obtain antibiotics.

2. Determine if there is any association between various socio-demographic factors and how much people in Pune are misusing antibiotics.

A structured questionnaire, adapted from the WHO AMR public awareness survey, was used to carry out a cross-sectional descriptive study. A total of 136 responses were recorded from individuals aged 18 and above, across Pune and outside of Pune. The responses were recorded in a systematic fashion, and the collected responses were divided and organized into sections that cover the following: 1. Demographics 2. Knowledge of AMR 3. Attitudes toward antibiotic use 4. Common practices related to antibiotics and infections.

The results show some big holes in knowledge and understanding and a number of misconceptions. Most people (69.9%) understood that it is the bacteria that become resistant—not humans—but a significant portion still believed (52.2%) that antibiotics can cure viral

illnesses like the cold. About 73.5% of respondents disagreed with the idea of stopping antibiotics when one starts to feel better, but 22.8% said they would stop taking antibiotics when they feel better. A promising 83.8% of participants reported that it is unsafe to take antibiotics without a prescription. However, nearly 1 in 5 had never heard about AMR. When prompted, the most common sources of information included health workers (51.5%), pharmacies (47.1%), and traditional media (35.3%). Finally, 67.6% of our participants believed that we could reduce our dependence on antibiotics through improved hygiene and more vaccines. Even though some groups are aware about antibiotics and their use, there are still a huge number of people who could not even name a single type of antibiotic and were not clear about what bacteria are. This lack of clarity and ignorance leads a lot of people to believe that antibiotics are the solution to all problems of poor health. Misunderstandings like these within the public about the use of antibiotics could have very serious consequences. Empowering pharmacists, doctors, and community health workers to serve as educators, alongside using mass media and digital platforms, can play a major role in eradicating AMR.[3] Strengthening AMR stewardship and surveillance at the community level is essential to prevent further escalation of this global health threat.

ACKNOWLEDGEMENT

As my project report nears completion, I would like to take this time to thank everyone who contributed to my research. It gives me great pleasure to take advantage of this once-in-a-lifetime opportunity to thank my esteemed faculty and the Dean & Associate Professor of the School of Pharmaceutical Management at the IIHMR University, Jaipur, for their unmatched & outstanding support & encouragement as I worked to finish my course and dissertation. I would also like to thank my guide and faculty mentor Dr. Akshay Kumar Mishra, Associate Professor, IIHMR University, Jaipur, for his unwavering support and guidance.

Place:

Date: 17/06/2025

Atharva Rajaram Suryawanshi

Table of Contents

Chapter 1: Introduction

1.1 Background and Rationale

Antimicrobial resistance (AMR) has become a worldwide issue of health, which makes it challenging to treat diseases, control infections, and maintain good health systems. This problem occurs when organisms, like fungi, viruses, parasites, and bacteria, develop many way to avoid the effects of antimicrobial drugs.[4] Within these, antibiotic resistance is very much of concern, because of the lack of proper use of antibiotics in the environment.[5]

Especially in India, the weight of AMR is very acute. Many factors lead to the problem, including self-medication, the easy availability of over-the-counter antibiotics without prescriptions, a lack of awareness, and a incomplete course of antibiotics.[6] Research indicates that many people hold significant misconceptions about how antibiotics should be used, often taking them for viral infections like the common cold or stopping treatment as soon as they start to feel better.[7] These habits not only diminish the effectiveness of antibiotics but also encourage the rise of multidrug-resistant organisms.[8]

Understanding knowledge of the community is important in this fight against AMR, yet there is always limited research on awareness in the public, attitudes, and practices in developed areas of India, example Pune.[9] The study will help to fill the gap by knowing how well the public knows AMR, their habits of use of antibiotic, and what is their source of information. These findings will provide important insights for interventions and the evolvement of health policies.[10]

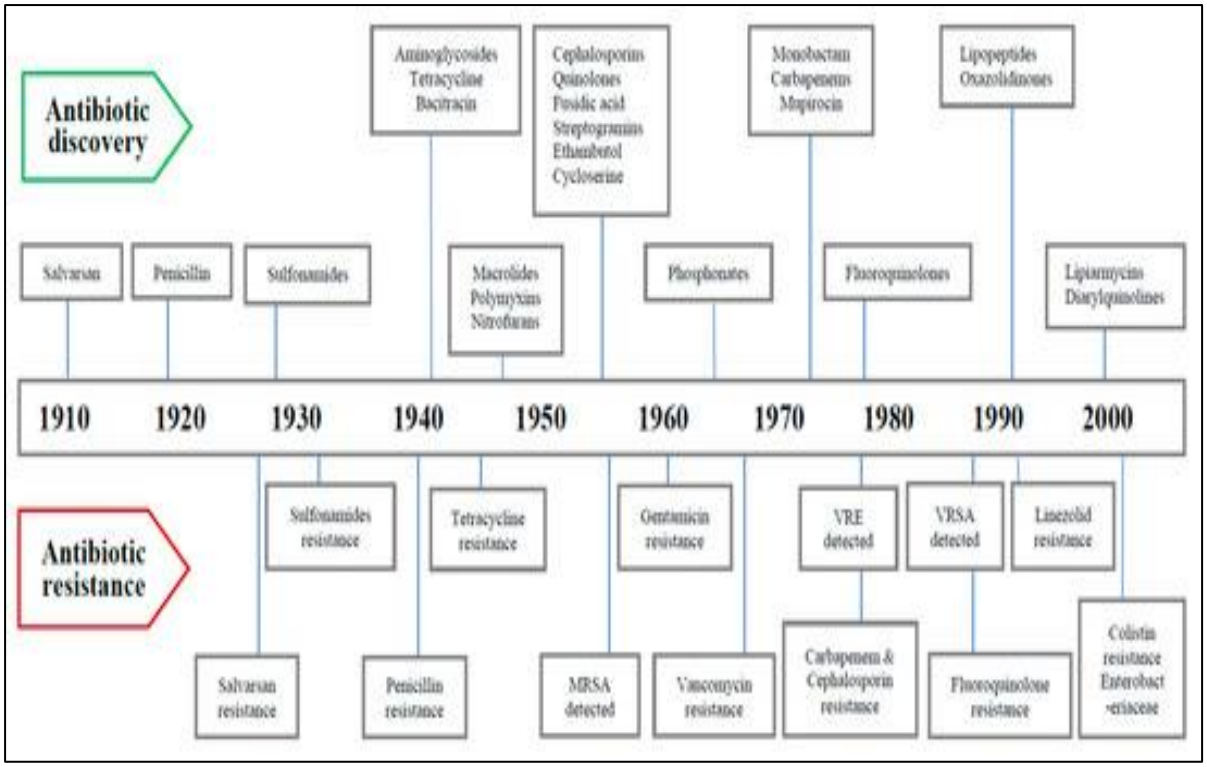


Fig 1. Antibiotic discovery and resistance

1.2 Problem Statement

In spite of the known importance and seriousness of antimicrobial resistance (AMR) and there are national guidelines which promote important antibiotic use, there's still a considerable gap between what policies suggest, what people actually do, especially in urban areas like Pune.[11] Healthcare professionals are becoming more aware of the AMR threat, general public often doesn't fully understand what AMR is, how it comes about, and how their actions can either help spread it.[12]

The condition is made worse by norms of self-medication and a lack of effective health education campaigns. Patients often buy antibiotics even if they don’t need or are bought without prescriptions or may buy antibiotics directly from pharmacies and not consulting a doctor. These are the main reasons why antibiotic resistance develops in people.[13, 14]

It's important to deeply examine the current levels of knowledge, attitudes, and practices (KAP) of antimicrobial resistance among the general population in Pune.[15] It is important to pinpoint specific knowledge gaps, understand the reasons for harmful behaviours, and identify where people purchase their antibiotics.[16]

1.3 Objectives

The main goal of this research is to play a part in the global and national fight against antimicrobial resistance by shedding light on community-level factors in Pune.

Primary Objective:

- To evaluate how much the public knows, thinks, and acts regarding antimicrobial resistance in Pune and other regions of India.

Secondary Objectives:

- To pinpoint where the general public in Pune typically gets their antibiotics.
- To examine how antibiotics are misused, including issues like self-medication and not following medication guidelines.
- To explore the connection between the public's understanding of AMR and their antibiotic usage habits.

1.4 Research Questions

• How aware and informed are the people of Pune about AMR?

• What are the common trends in antibiotic use and misuse, such as self-medication, sharing, and not completing courses, among the general public in Pune?

• Is there a relationship between demographic factors (like education level, age, and gender) and awareness, attitudes, and behaviors regarding AMR among the people of Pune?

• Where do people in Pune mainly get their antibiotics, especially without a prescription?

• Is there a noticeable connection between AMR information and the adoption of responsible antibiotic use practices among the public in Pune?

1.5 Hypotheses

Drawing from existing research and the problem statement, we will test the following hypotheses:

• **H1:** A greater understanding of antimicrobial resistance is linked to fewer cases of antibiotic misuse (like self-medication and not completing courses) among the public in Pune.

• **H2:** Higher education levels are positively associated with responsible antibiotic use practices, such as following prescriptions and fewer instances of self-medication, among the general public in Pune.

1.6 Scope and Limitations

Scope: This study is specifically designed to explore how people aged 18 and older in Pune and its surrounding areas in Maharashtra, India, understand antimicrobial resistance (AMR), as well as their attitudes and actions regarding it. The aim is to collect data from various backgrounds to get to know the community's views on AMR. These insights which are gained from this will be valuable for making public health policies for people.

Limitations: Even when planning is done, there are many limitation of this study which needs to be tackled with. These include:

• **Self-reported data:** Depending solely on survey responses can lead to bias in the response. Participants might provide biased answers instead of honest responses, which could lead to misinterpretation of the responses and will hamper the results..

• **Cross-sectional design:** This project has used a cross-sectional research approach, it captures a snapshot of knowledge, attitudes, and practices (KAP).

• **Limited current sample size:** Currently, we have collected 136 responses. While we can draw some preliminary insights, we won't be able to generalize our findings to the entire population of Pune until we reach our target sample size.

• **Geographic scope:** This study is limited to Pune. While the findings may be applicable to other urban areas in India, we should be cautious about directly applying them to rural populations or regions with different healthcare access and cultural norms.

• **Questionnaire detail:** Although the questionnaire is based on a WHO survey, it might not capture every subtle aspect of KAP or the intricate factors that influence antibiotic usage behaviors.

Chapter 2: Literature Review

2.1 Perspective of AMR Globally

AMR, or antimicrobial resistance, stands out as one of the top ten global health threats. This is mainly because it can make common treatments ineffective, leading to persistent infections, longer hospital stays, skyrocketing healthcare costs, and increased mortality rates.[17]

Resistance develops naturally over time, often due to genetic changes in microorganisms.

The increased use of antibiotics in healthcare, the environment, and agriculture has resulted in antimicrobial resistance.[18] Many people use antibiotics without prescription, take antibiotics in wrong doses, or consume for non-bacterial illnesses like viral infections, which only increases the rise of resistant pathogens.[19]

On a larger scale, AMR is not only a global issue, it has also become a global threat to mankind and humans.

Resistant organisms are found in water sources, food chains, livestock, and in the environment.Due to the ease of travel within international borders, these resistant organisms are transferred easily into other countries, resulting in their spread.[20]

Inspite of the awareness, progress in combating AMR is not consistent worldwide which is causing many issues.[21]

Many high-income countries have made antimicrobial stewardship programs and surveillance networks, whereas many low- and middle-income countries are still facing challenges such as no following of antibiotic regulations and decrease in public health infrastructure.[22]

These gaps need to be closed to prevent AMR from becoming another global health pandemic.

2.2 AMR in India

India plays a crucial role in the global AMR story. India is always highlighted as a growing place for resistant pathogens in the world.

Many factors contribute to the increase in the antibiotic resistance in India. India has a population of 1.4 billion, which causes a significant burden of infectious related diseases, and different access to healthcare in India.[23]

The challenges are very difficult to tackle because of limited healthcare infrastructure and decreased resources.[24]

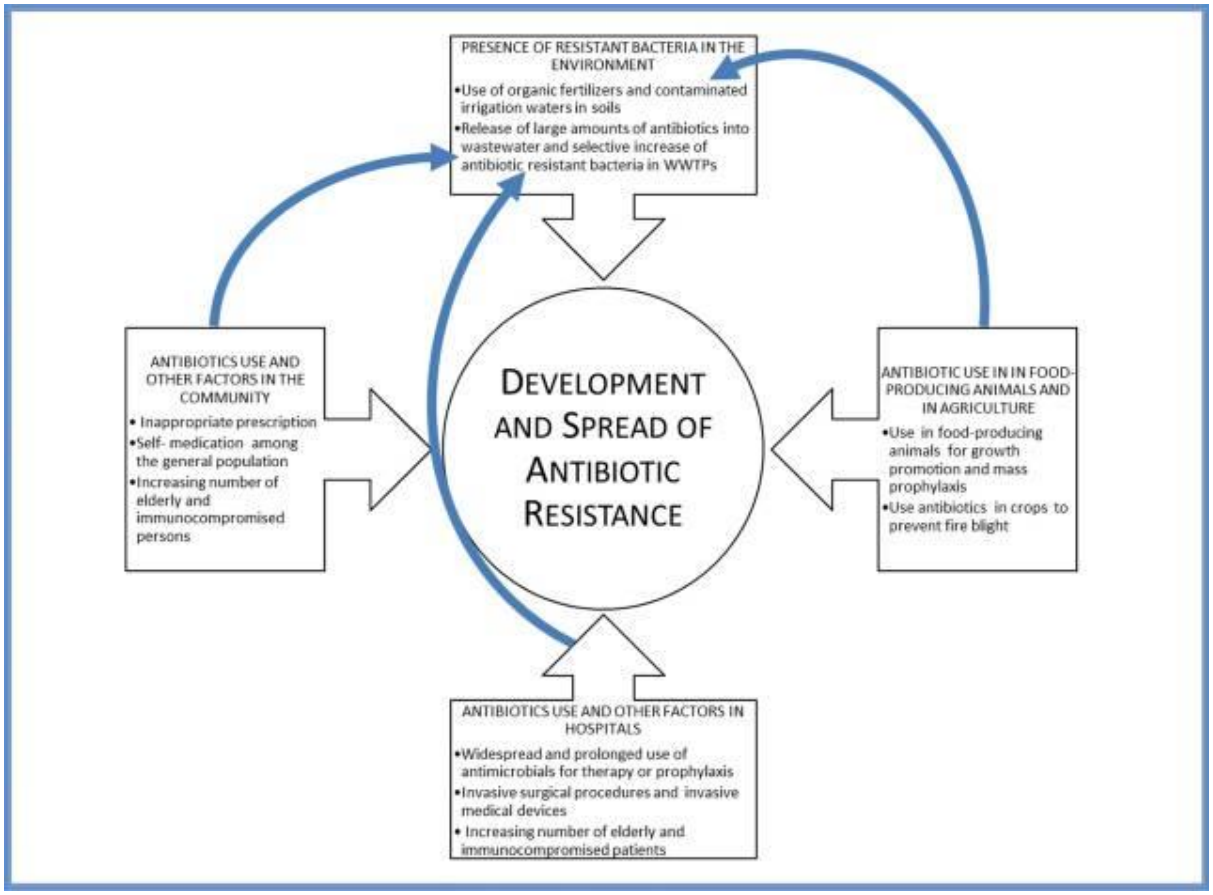


Fig 2. Development and Spread of Antibiotic Resistance

- One of the main reason for antibiotic resistance (AMR) in India is the increasing rate of antibiotic use in India. Research consistently places India among the top consumers in the world.[25] This high level of use is generally attributed to a troubling trend of misuse, such as prescribing antibiotics for viral infections, opting for broad-spectrum antibiotics when narrower options are available and would work better, and patients stopping their treatment as soon as they start feeling better.[26]
- A significant concern is the widespread practice of selling antibiotics without a prescription. Even though there are regulations meant to prevent this, pharmacies do not entertain these types of rules.[27] Pharmacies often dispense antibiotics without a doctor's receipt, because of patient demand. weak enforcement of rules. Law enforcement officers also take bribes and finish off such types of matters, Patients also do this to get quick relief from symptoms.[28] This easy access leads to self-medication. People diagnose and treat themselves without proper medical advice, which can result

in incorrect dosages. Also poor antibiotic choices, and also incomplete treatment courses. This lack of regulation and plays a important role in creating the conditions that foster resistance.[29]

- Additionally, there are differences in knowledge and practices across regions, which points to the need for strategies that are tailored to specific contexts.[30]
- Research from **Southeast Asia**, particularly in countries like **Vietnam and Thailand**, has also revealed widespread misuse of antibiotics. This includes issues like non-prescription sales and incomplete treatment courses.[31] These studies often point to the easy availability of pharmacies and limited access to healthcare professionals as factors that contribute to these inappropriate practices.[32]
- Overall, these **KAP studies** reveal a common trend: despite the rise in awareness campaigns, there are still significant gaps in knowledge and concerning practices regarding antibiotics around the world. Many people mistakenly believe that antibiotics can cure viral infections, tend to stop treatment too soon, and think that resistance only affects those who misuse antibiotics.[33]

2.4 Research Gaps

Even with a wealth of research on antimicrobial resistance and KAP studies, there are still some important gaps, especially in the context of India:

- **Insufficient Community-Based Data in Indian Metro Cities:** While there are some studies on AMR in India, there's a lack of comprehensive, large-scale, and up-to-date community-based KAP data from major metropolitan areas like Pune. A lot of the data we currently have comes from healthcare settings, specific groups like students, or smaller towns. However, we really need to dive deeper into the unique challenges faced by diverse urban populations when it comes to healthcare access, public health infrastructure, and socio-economic factors.
- **Understanding the Attitudes Behind Misuse:** KAP studies often highlight misuse practices, such as self-medication or not completing treatment courses, but they usually fall short in exploring the deeper attitudes, beliefs, and societal pressures that lead to these behaviours. For example, what drives someone to self-medicate? Is it about convenience, cost, trust in pharmacists, or simply not grasping how serious their

condition is? Getting to the bottom of these motivations is essential for creating effective interventions that can change behaviour.

- **The Role of Local Context in KAP:** The findings from international KAP studies don't always translate well to the Indian context, given the significant differences in healthcare systems, regulations, cultural practices, and public health literacy. We need research that specifically looks at how local factors in Indian cities shape public knowledge, attitudes, and practices regarding antimicrobial resistance (AMR).[34]
- **Evaluating Awareness Campaigns:** Although awareness campaigns are suggested, there's a noticeable
- lack of thorough evaluations on how effective these public awareness efforts are in actually changing knowledge, attitudes, and practices, and ultimately in reducing antibiotic misuse in Indian communities.[35]
- **Exploring Procurement Pathways:** Some studies mention where antibiotics come from, but we need a more detailed look at the common ways people obtain them, especially without prescriptions, and the socio-economic factors that influence these decisions. This could help guide targeted regulatory and educational initiatives.[36] This study aims to address some of these gaps by providing current community-level data on KAP regarding AMR in Pune, thereby contributing to a more nuanced understanding of the problem in urban India and informing targeted public health strategies.[37]

Chapter 3: Methodology

3.1 Study Design

This study employs an observational, cross-sectional, and analytical research approach. The cross-sectional method was used to gather data from a wide range of individuals at a single point in time, offering insights into the general public's current understanding, attitudes, and actions regarding antimicrobial resistance (AMR) in Pune. This is a observational study. Its goal is to describe existing scenario without any problem. The analytical aspect involved exploring the connections and relationships between various demographic factors. A structured

questionnaire is used for data collection, ensuring consistency and for doing quantitative analysis.

3.2 Study Area

This research was conducted in Pune city and its peri-urban areas in Maharashtra.

3.3 Population and Sample

The study population comprised the general public aged 18 and older. Living in Pune city and its peri-urban areas and also individuals from other states. The target sample size was set at 350 respondents. It was calculated based on standard practices for KAP studies to ensure statistical significance and the ability to generalize findings to the larger population of Pune. Till now, 136 responses have been collected, and data collection is still ongoing to reach the target sample size.

3.4 Inclusion/Exclusion Criteria

- **Inclusion Criteria:**
    - Individuals aged 18 years and above.
    - Residents of Pune city and/or its peri-urban areas.
    - Individuals who gave their informed agreement to participate in the study.
    - Individuals who were able to understand the questionnaire (in English).
- **Exclusion Criteria:**
    - Healthcare professionals (e.g., doctors, nurses, pharmacists) to avoid expert bias, as the study specifically targeted the general public's knowledge.
    - Individuals who were unable to provide informed consent.
    - Individuals who refused to participate in the study.

3.5 Sampling Method

- **Area Cluster Selection:** Pune city and its surrounding areas were divided into various geographic zones. From these, we randomly selected specific zones/wards to act as our primary sampling units.

- **Individual Selection:** From each selected household, one eligible adult was selected to participate, ensuring they met our inclusion criteria. This method of selection reduces the bias and improves the accuracy.

Study Tool

The tool for the study used is a structured questionnaire. The questionnaire is prepared by referring to the WHO guidelines.

Pilot Testing

A pilot study was conducted with **20 people** before beginning with the actual study.

- Evaluate the clarity, understanding, and relevance of the questionnaire.
- Spot any ambiguities, confusing terms, or sensitive questions that could cause discomfort or lead to biased responses.
- Estimate the average time it would take for participants to complete the questionnaire.
- To refine the data collection procedure and interviewer training. Based on the feedback received during the pilot testing, minor revisions and clarifications were made to the questionnaire to enhance its effectiveness and ease of administration.[36]

3.8 Data Collection Procedure

- Data was gathered through a mix of in-person interviews and responses collected via Google Forms.
- For the face-to-face interviews, trained research assistants visited selected households. They explained the purpose of the study, secured informed consent, and read the questions aloud to participants while jotting down their answers. This approach allowed for any questions to be clarified on the spot and helped minimize missing data.
- For those who preferred to submit their responses online or for a broader reach, a secure link to a Google Form was shared. The form started with a digital consent page. On average, it took participants about 15 to 20 minutes to complete the questionnaire, whether they chose the interview or online method. Data collection kicked off after

receiving ethical approval and continued until we hit our target sample size or the study period came to an end.

3.9 Ethical Considerations

- Confidentiality and Anonymity: We treated all collected data with the utmost confidentiality. Participant responses were anonymized by assigning unique identification codes, ensuring that no personally identifiable information was linked to their answers.

3.10 Data Analysis Plan

The data we collected will be carefully processed and analyzed using statistical software to meet the study's objectives.

- **Knowledge Scores Calculation:** We will calculate a total knowledge score for each participant and categorize them into groups (like low, moderate, and high knowledge) based on their score ranges.
- **Software Used:** Data entry was done using Microsoft Excel. Analysis was also performed using **Microsoft Excel**.

Visualization: The results will be shown using bar graphs, pie charts, and visual aids.

Chapter 4: Results

The results are based on the findings collected through survey among public in Pune. We analyzed a total of 136 responses for this report.

4.1 Demographics

• **Total Respondents:** Our analysis is based on total 136 responses.

• **Gender Distribution:** The sample included 55.88% (n=76) males and 44.12% (n=60) females.

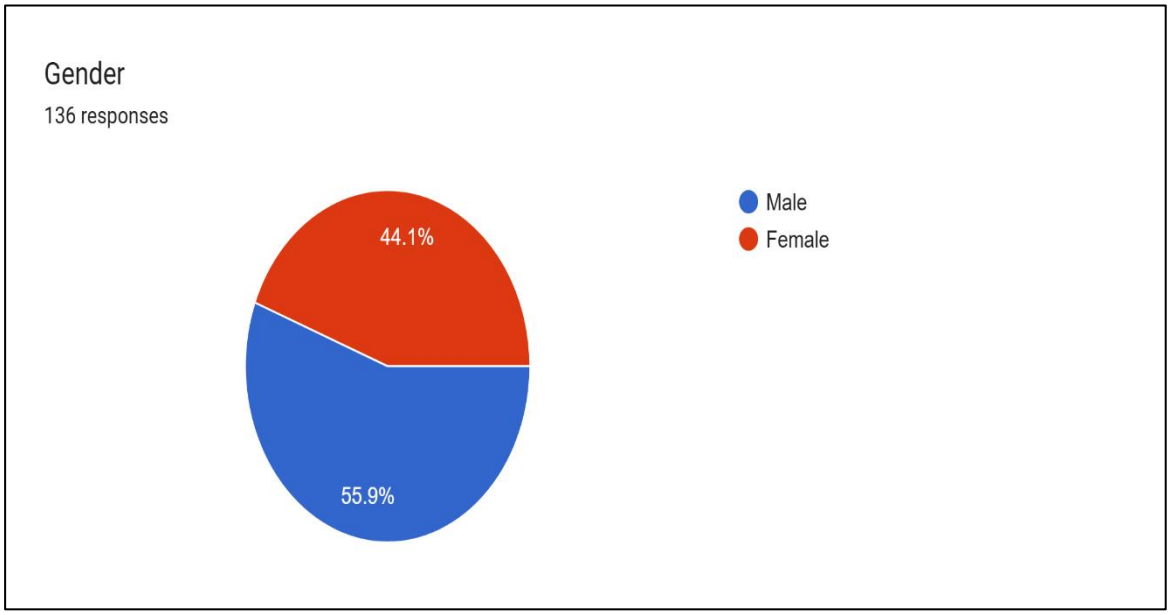


Fig 3.

- **Age Distribution:** The mean age of the respondents was approximately 36.18 yrs, with a SD of 14.73 yrs. The youngest participant was 18 yrs old, and oldest was 78 yrs.
- **Education Level:** The majority of respondents held Post Graduate degrees (42.65%) or Graduate degrees (41.18%), with smaller proportions having Higher Secondary (14.71%) or Secondary (1.47%) education.

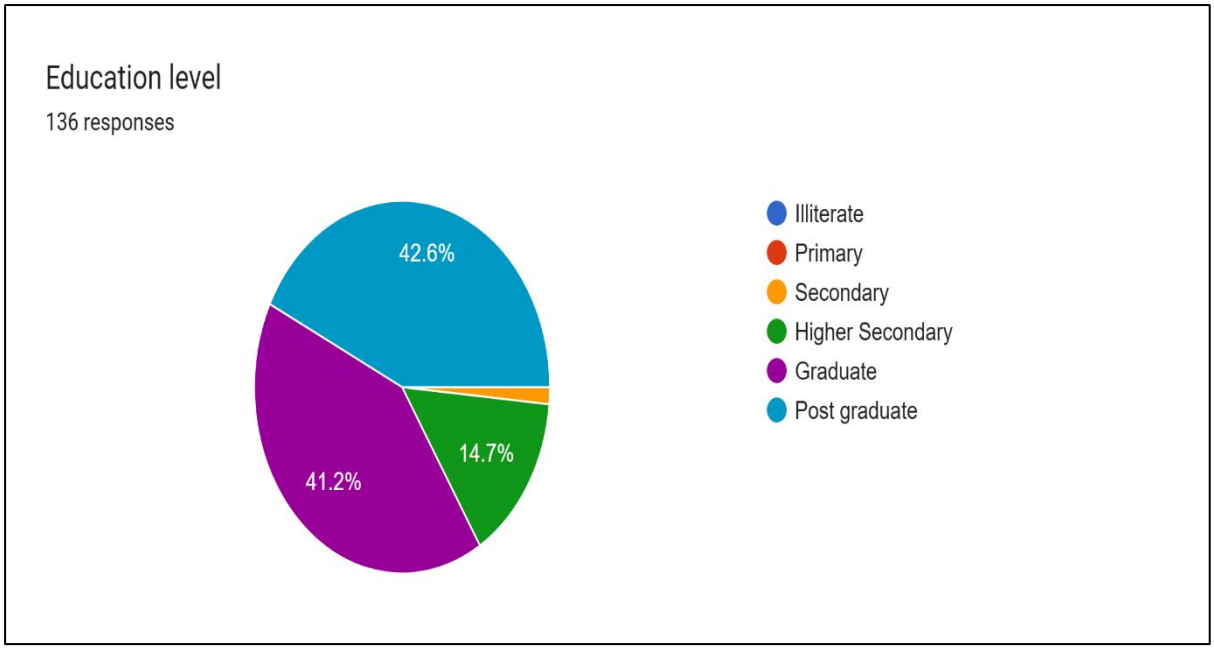


Fig 4.

- **Occupation:** The occupation distribution was varied, with Students (combining 'Student' and 'Student ') making up 25.73% of the sample. Other notable occupations included Job (8.82%), Business (8.09%), and Housewife (7.35%).
- **Monthly Household Income:** The largest group of respondents reported a monthly household income of Rs. 30,001 - Rs. 60,000 (40.44%), followed by > Rs. 60,000 (36.76%).

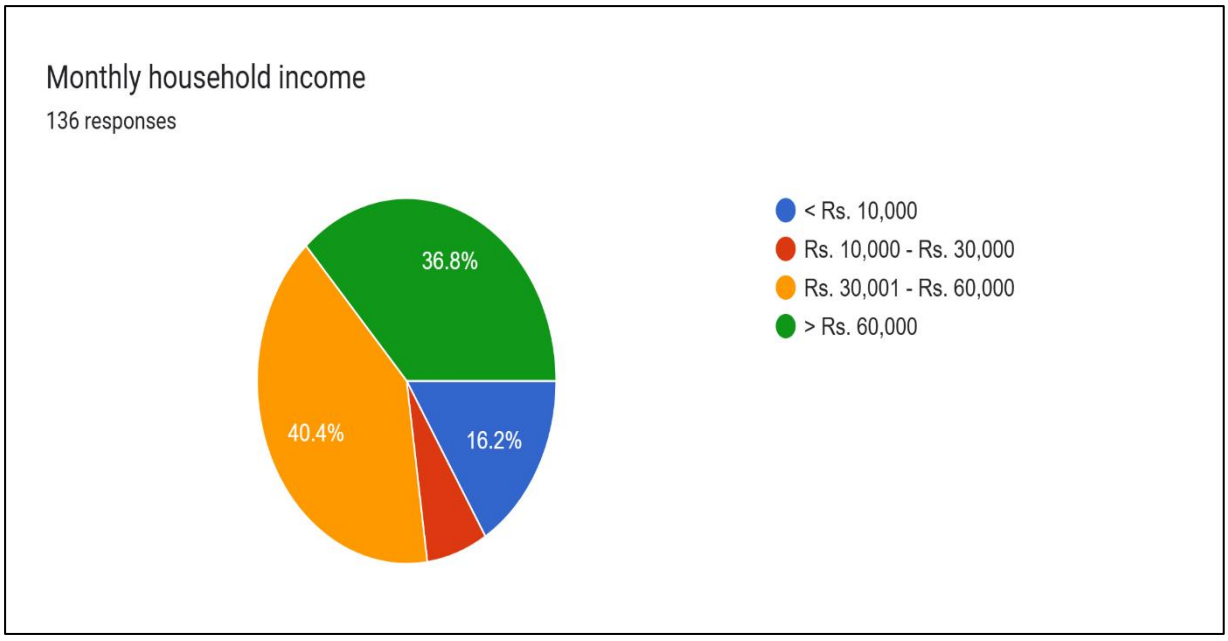


Fig 5.

4.2 Knowledge

Based on the survey responses collected from the general public in Pune, Maharashtra, the findings reveal both strengths and concerning gaps in knowledge about AMR and antibiotic use.

This section details the respondents' awareness and understanding of AMR.

- **Awareness of AMR:** 73.53% (n=100) of respondents reported having heard about the term "antimicrobial resistance (AMR)" or "antibiotic resistance." 26.47% (n=36) were unaware.

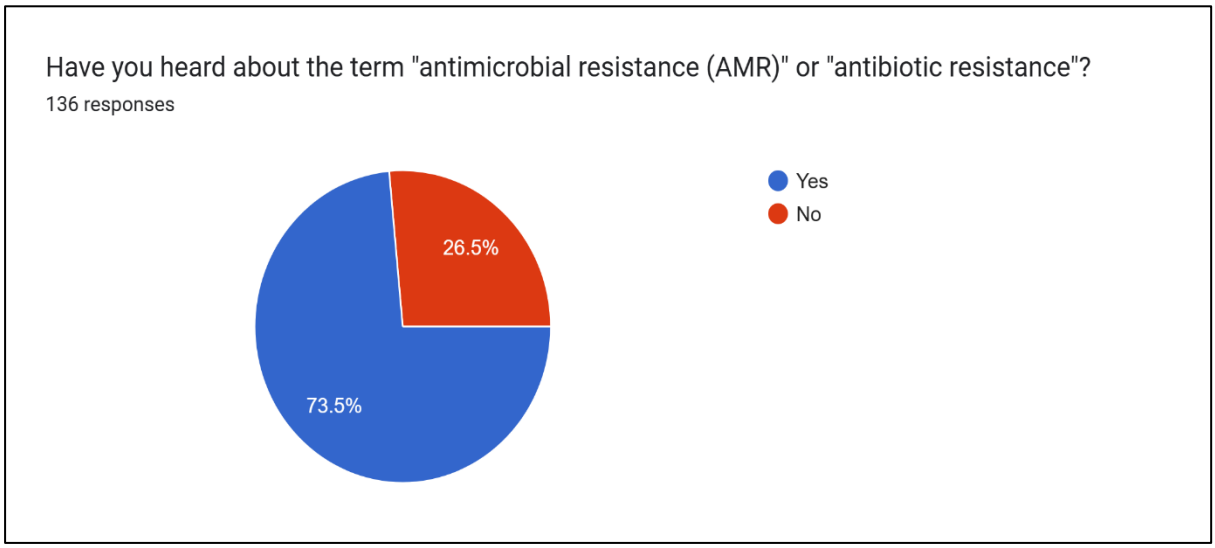


Fig 6.

To begin with, **52.2% of respondents incorrectly believed that antibiotics can cure viral infections** like the common cold and flu, while only **41.9% correctly identified this statement as false**, and **5.9% were unsure**. This indicates a significant misconception, as antibiotics are ineffective against viruses.

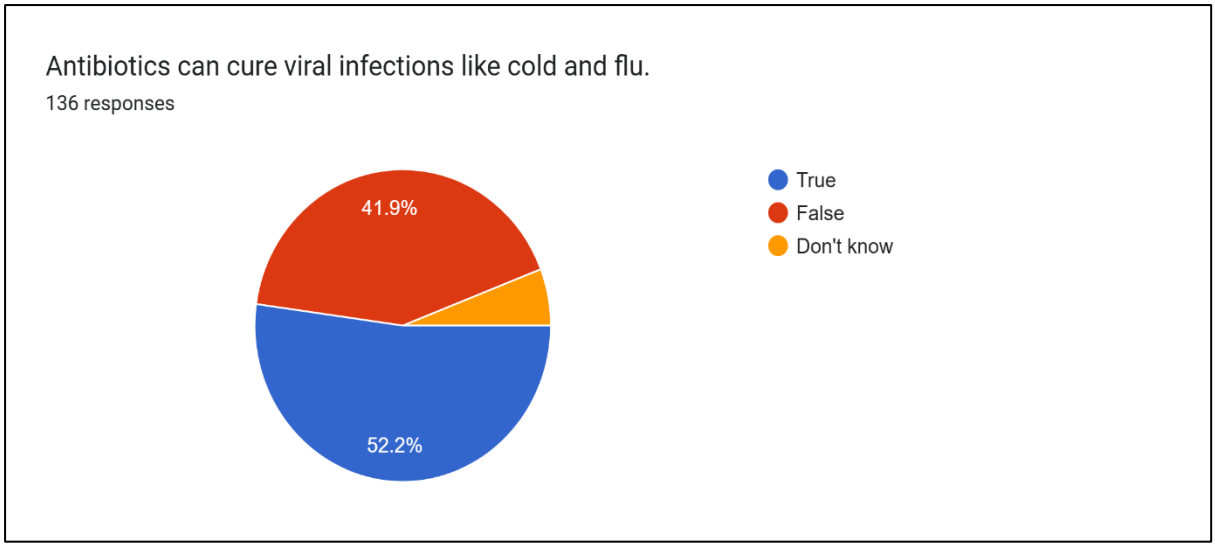


Fig 7.

However, there was more clarity on the concept of resistance itself—**69.9% of participants correctly understood that antibiotic resistance occurs when bacteria become resistant to antibiotics**, though **15.4% disagreed** and **14.7% were uncertain**.

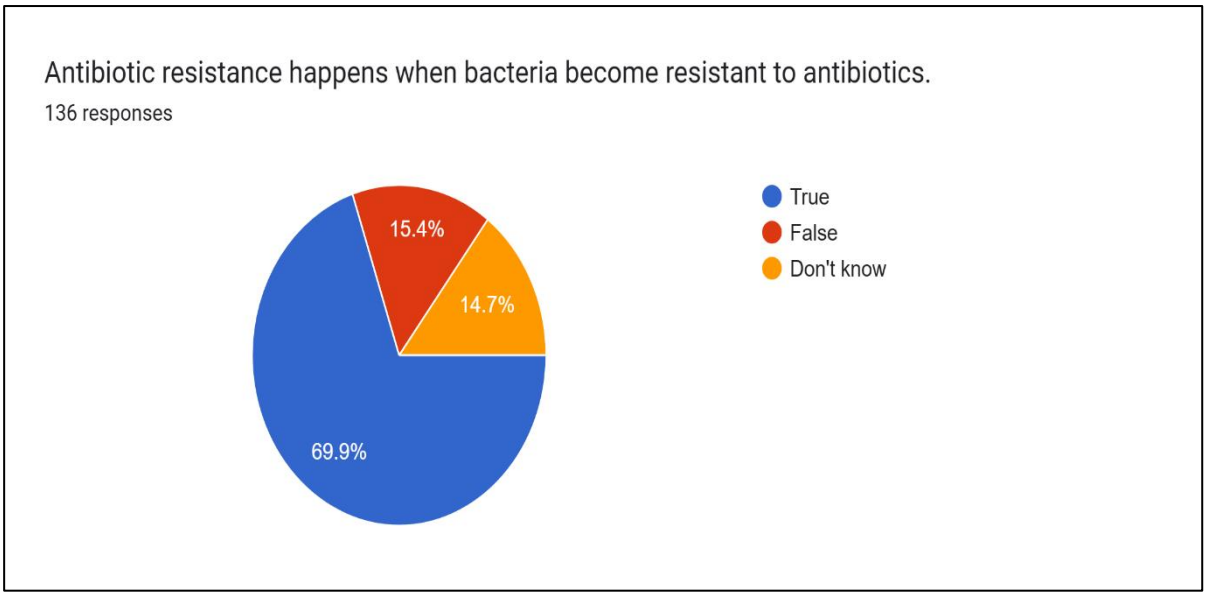


Fig 8.

Encouragingly, **73.5%** of respondents correctly **disagreed with the notion** that it is **appropriate to discontinue taking antibiotics after they start to feel better**, indicating a recognition of the significance of completing the entire prescribed course. However, **22.8%**

of respondents **agreed it was acceptable**, **raising the possibility of resistance formation.**

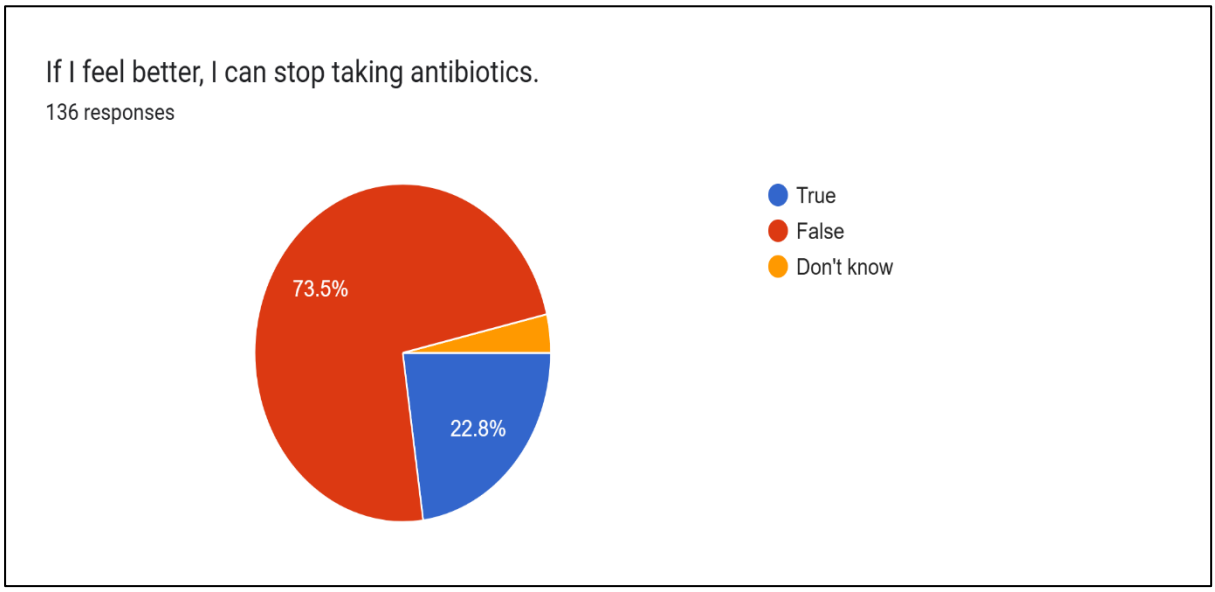


Fig 9.

A strong level of understanding was seen regarding self-medication, as **83.8% of respondents disagreed with the notion that taking antibiotics without a prescription is safe**. Still, **14.7% held the dangerous belief that it is safe**, highlighting the need for stricter pharmacy regulations and awareness campaigns.

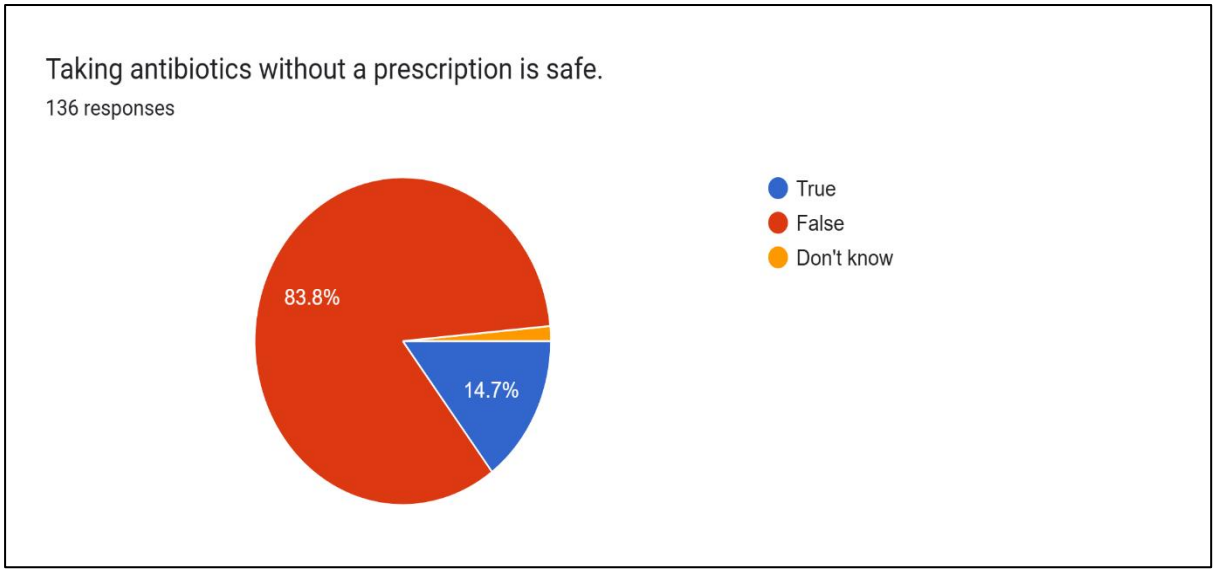


Fig 10.

When asked about transmission of resistant bacteria, **51.5% correctly identified that resistant bacteria can spread from person to person**, but **31.6% incorrectly**

believed otherwise, and **16.9% were unsure**—a gap that needs to be addressed in public health messaging.

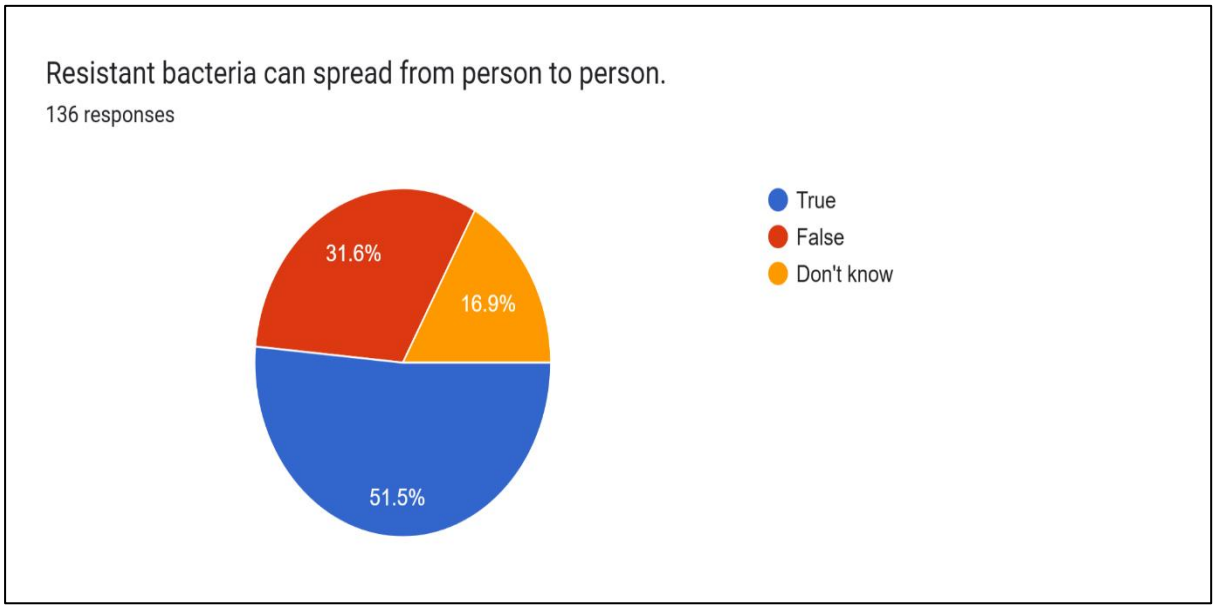


Fig 11.

Finally, **65.4% of respondents acknowledged that antibiotic resistance affects not just humans but also animals and the environment**, reflecting a growing recognition of the "One Health" concept. Nonetheless, **13.2% disagreed**, and a considerable **21.3% were uncertain**, indicating a need to strengthen awareness of AMR's broader ecological implications.

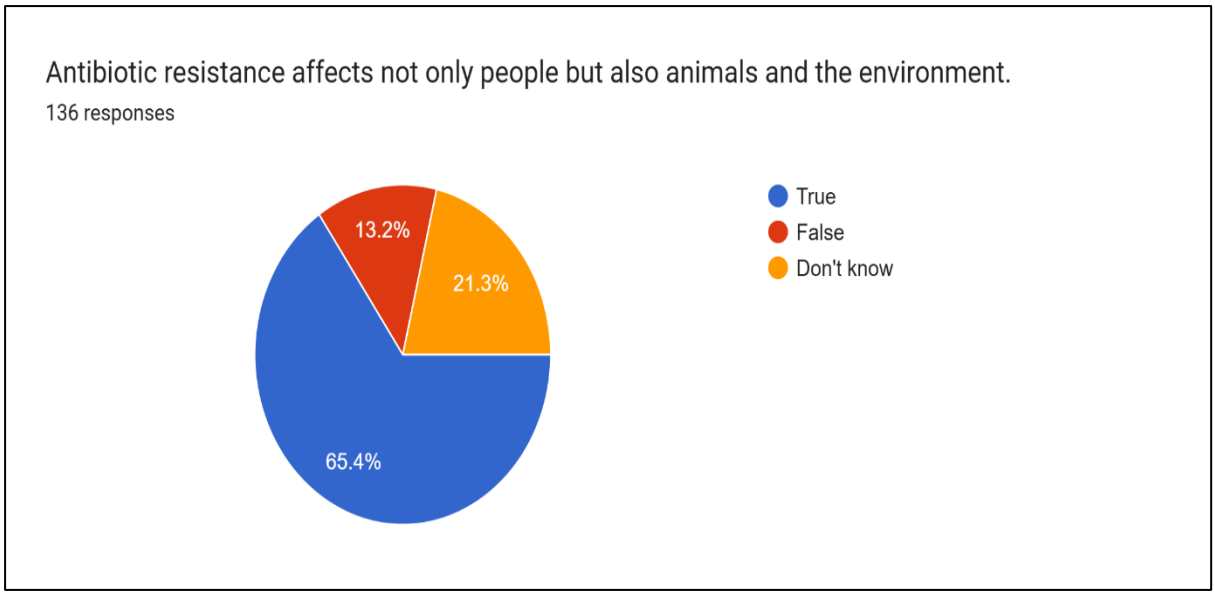


Fig 12.

Overall, while a substantial portion of the public demonstrates foundational knowledge of AMR, persistent misconceptions—especially regarding antibiotic use for viral infections and the implications of resistance—underscore the importance of targeted community education programs to improve understanding and mitigate misuse.

4.3 Attitudes

This section explores the respondents' perceptions and beliefs regarding AMR.

- **Perceived Seriousness of AMR in India:** 72.06% (n=98) believed that antibiotic resistance is a serious problem in India. 19.85% (n=27) thought it was not serious, and 8.09% (n=11) were not sure.

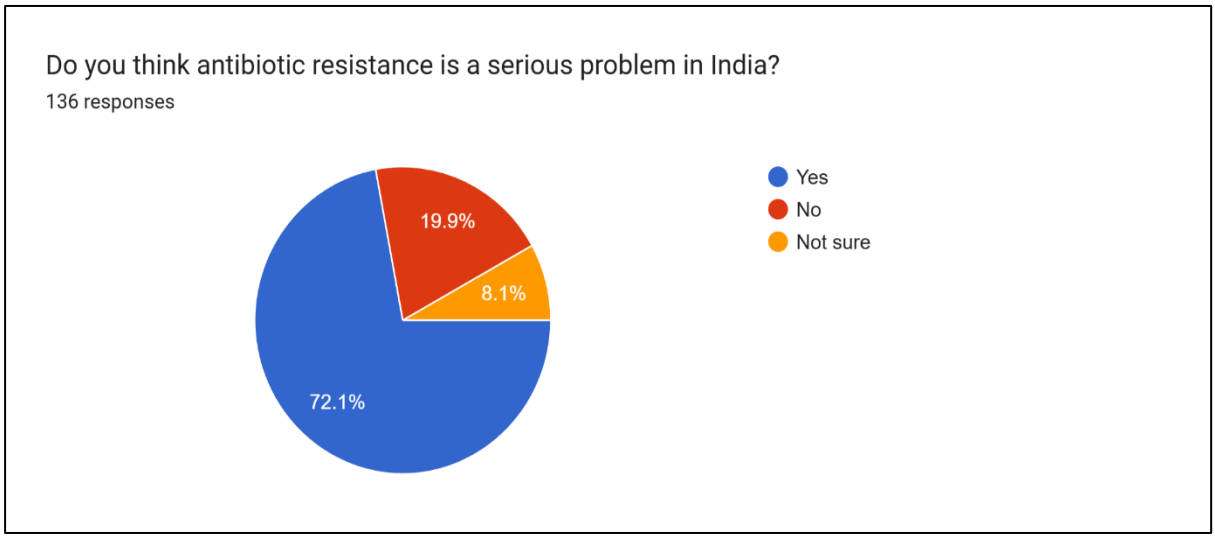


Fig 13.

- **Belief that Antibiotics are Overused:** 72.79% (n=99) of respondents believed that antibiotics are overused in their community. 13.97% (n=19) did not, and 13.24% (n=18) were not sure.

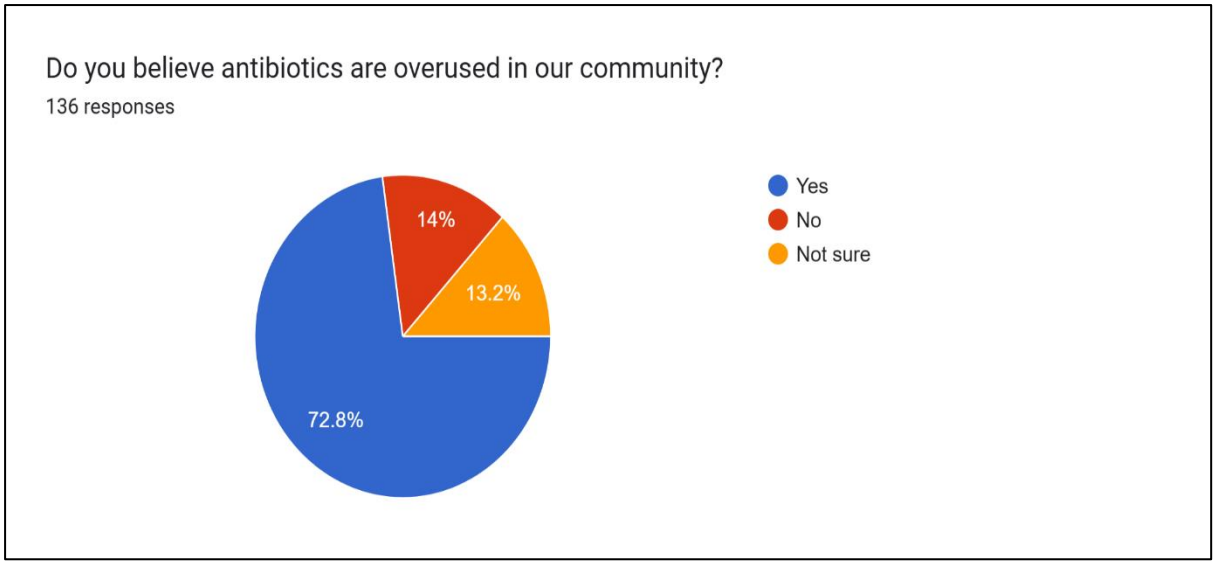


Fig 14.

- **Belief in Individual's Role in Combating AMR:** 63.97% (n=87) of respondents agreed that people like them can help stop antibiotic resistance. 16.91% (n=23) disagreed, and 19.12% (n=26) were not sure.

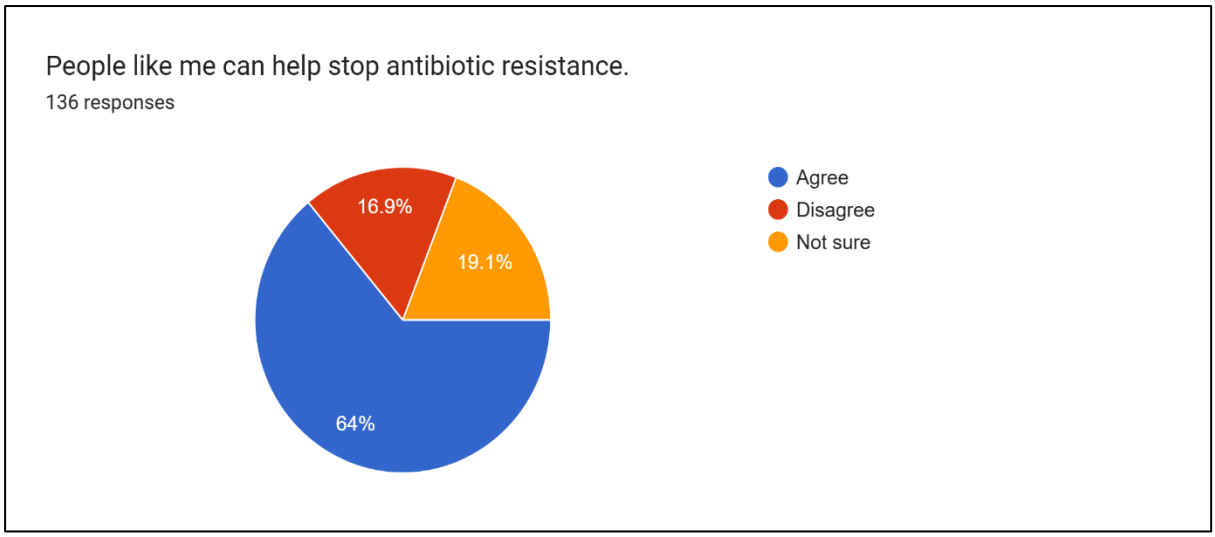


Fig 15.

- **Responsibility Attribution** (Multiple selections allowed):
    - Doctors: 77.94% (n=106)
    - Government: 68.38% (n=93)
    - Pharmacists: 59.56% (n=81)
    - Patients: 55.88% (n=76)

- Me/the individual: 40.44% (n=55)
- Don't know: 8.82% (n=12)

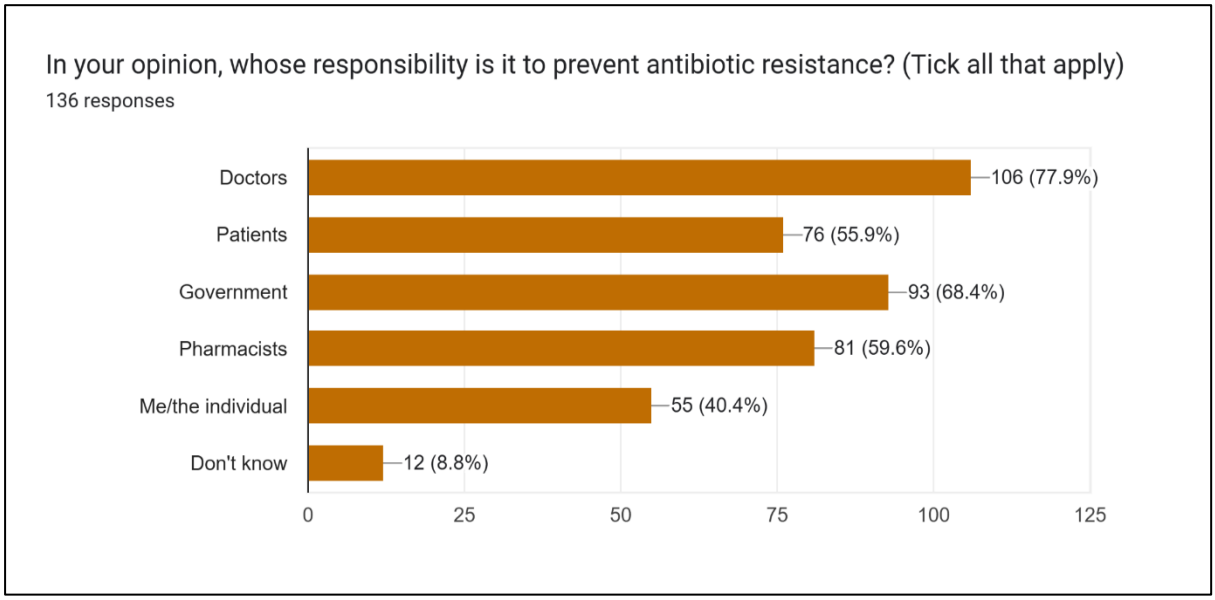


Fig 16.

4.4 Practices

This section details the actual antibiotic use behaviors reported by the respondents.

- 66.18% (n=90) of respondents reported using antibiotics during the past 6 months.

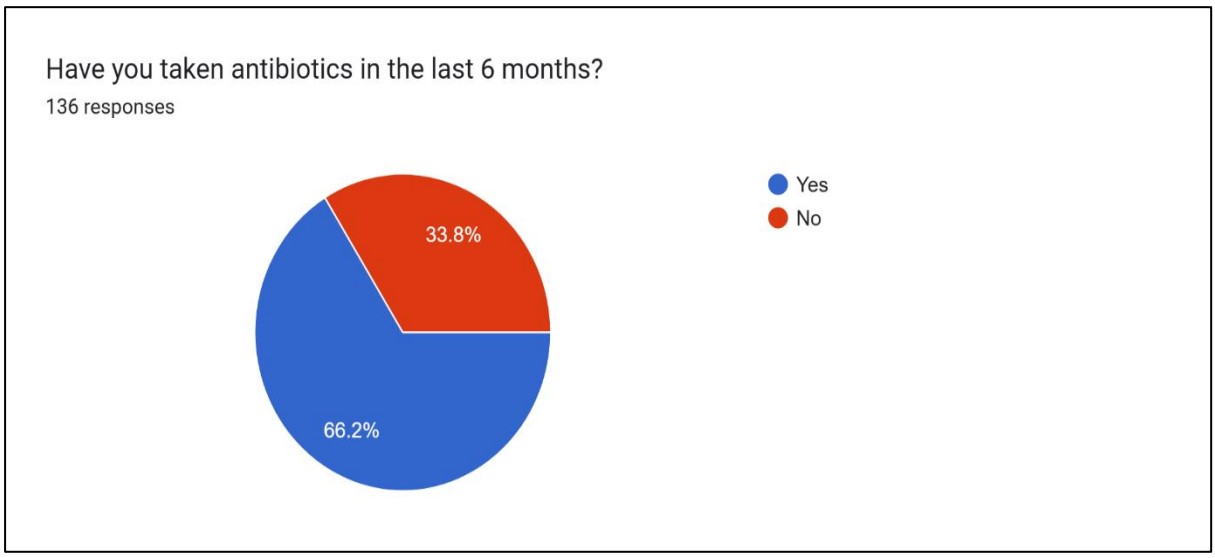


Fig 17.

- **Prescribed by Doctor** (Among those who took AB in last 6 months): Among the 90 respondents who took antibiotics, 86.67% (n=78) stated that a doctor prescribed them, while 13.33% (n=12) did not have a doctor's prescription.

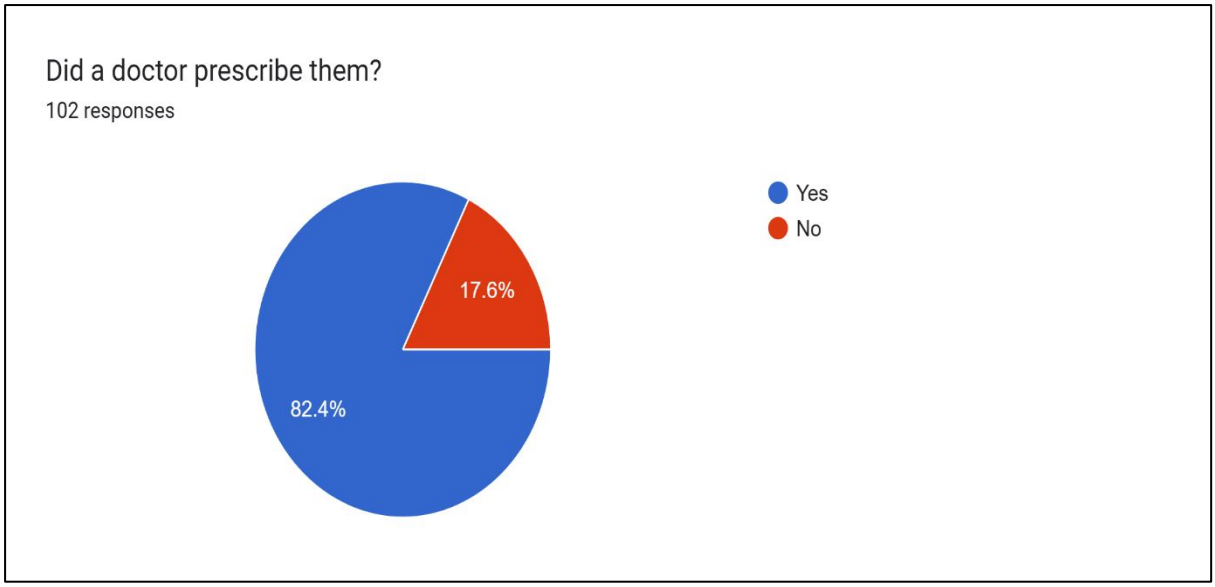


Fig 18.

- **Ever Bought Antibiotics Without Prescription:** A significant proportion, 71.32% (n=97), reported having ever bought antibiotics with no prescription.

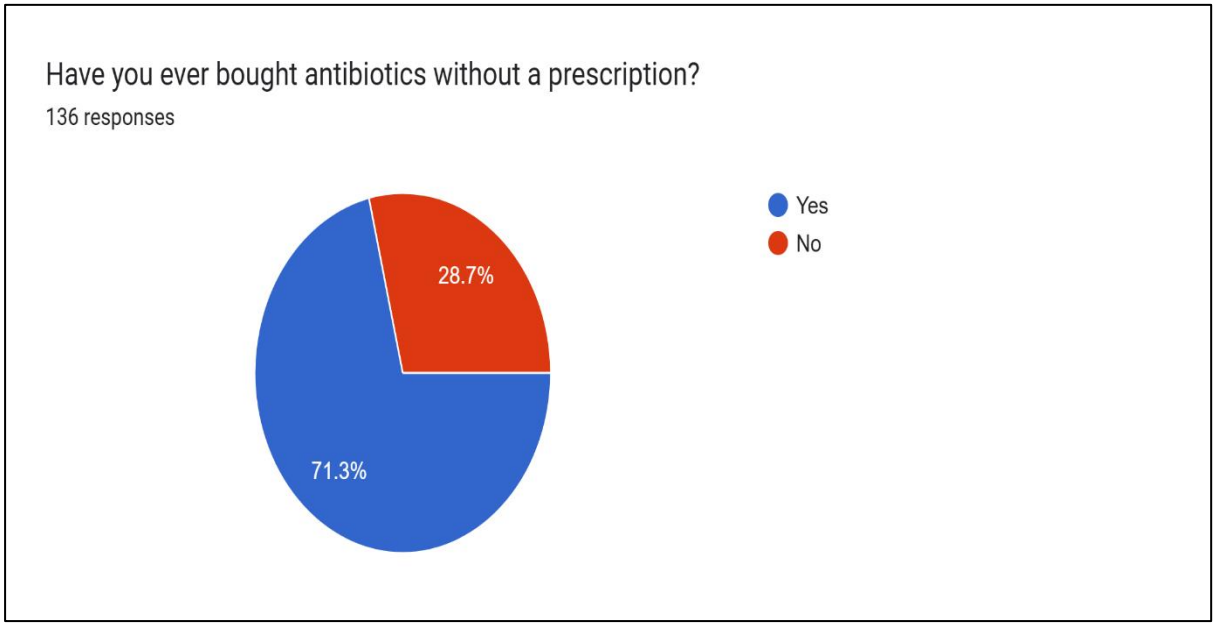


Fig 19.

- **Completing Full Course of Antibiotics:** 72.79% (n=99) reported always completing the full course as prescribed. 22.79% (n=31) sometimes completed it, and 4.41% (n=6) never completed it.

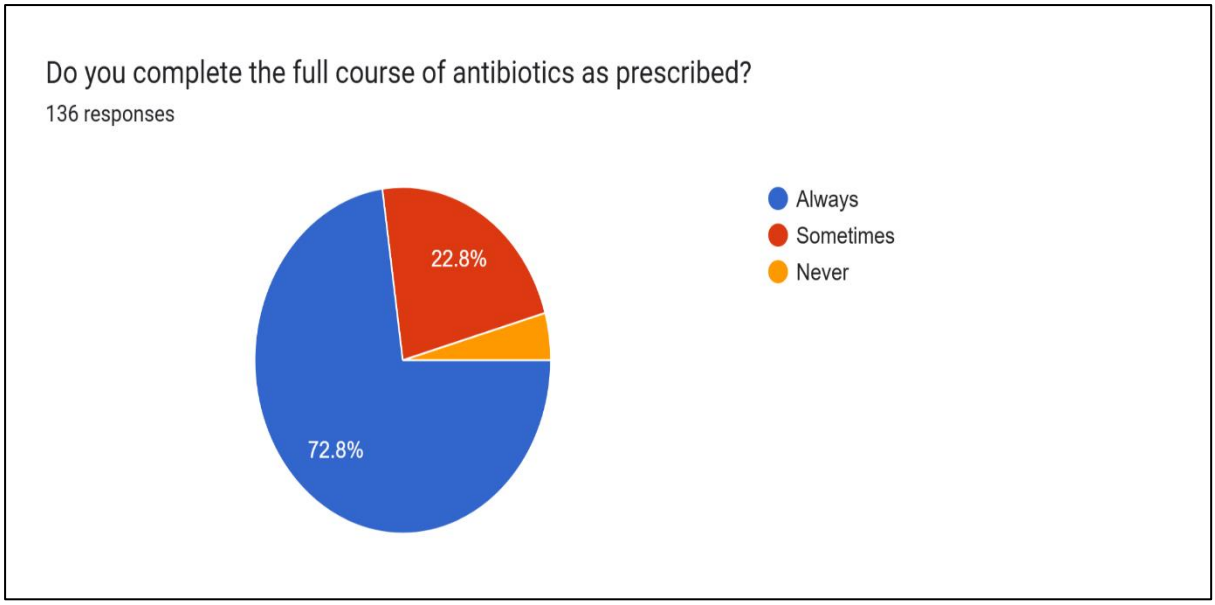


Fig 20.

- **Keep Leftover Antibiotics for Future:** 63.24% (n=86) respondents admitted to keeping remaining antibiotics for future.

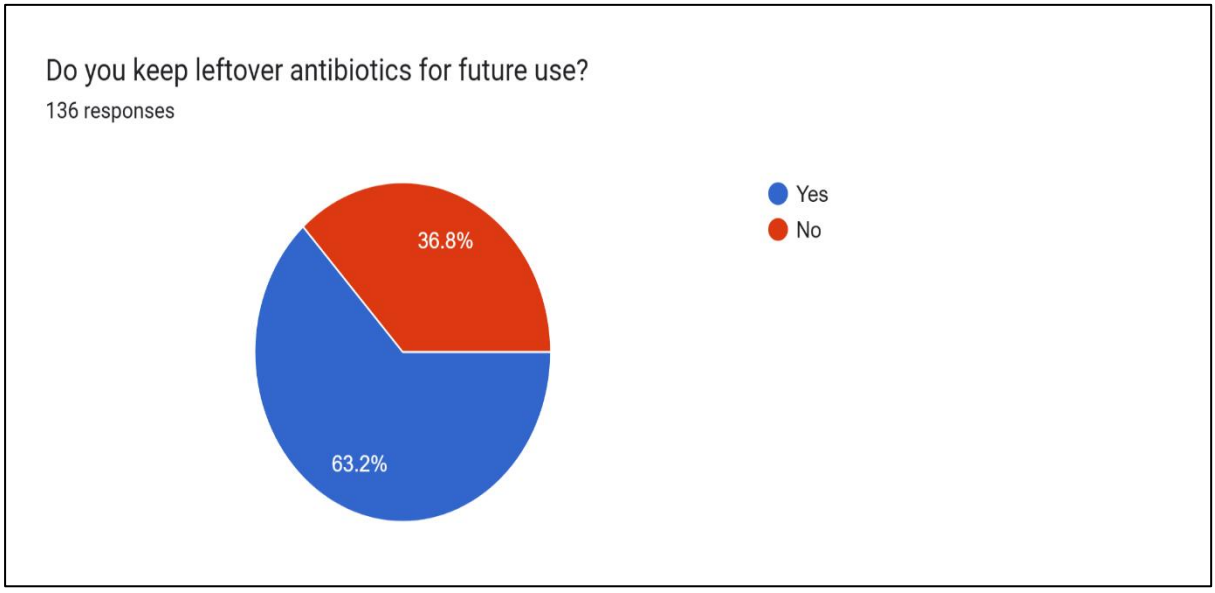


Fig 21.

- **Ever Shared Antibiotics:** 55.88% (n=76) of respondents reported having ever shared their antibiotics with someone else.

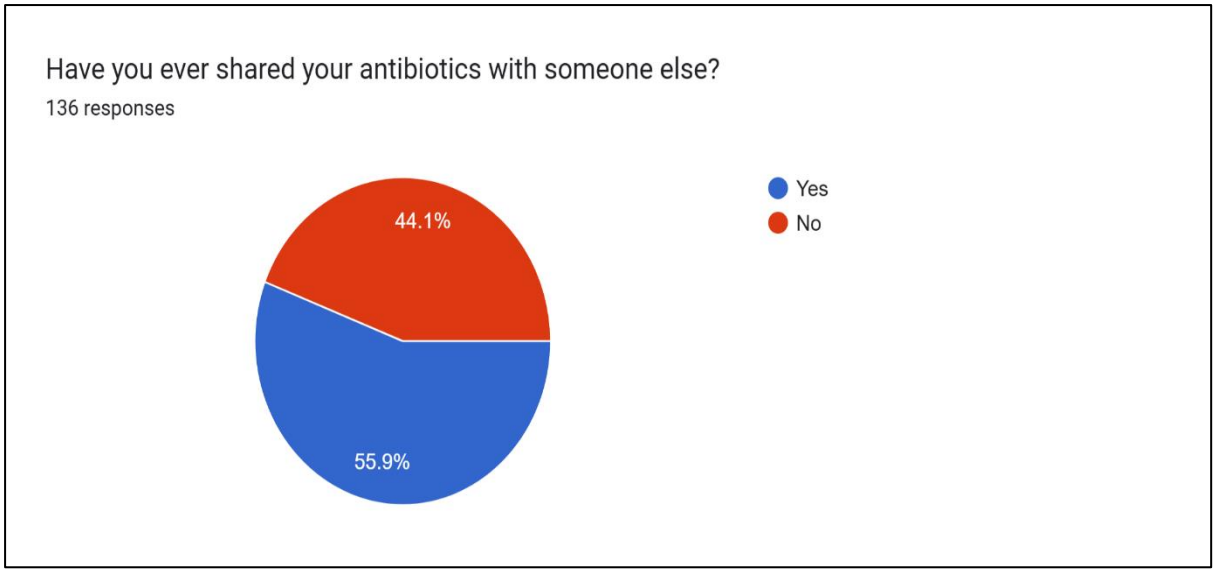


Fig 22.

4.5 Sources of Antibiotics (If bought without prescription)

This analysis focuses on the sources of antibiotics, particularly for those who reported buying them without a prescription (n=97).

- Among the 97 respondents who had bought antibiotics without a prescription:
    - Medical Store: The most common source was a Medical Store (87.63%).
    - Leftover at home: 34.02% used leftovers at home.
    - Family/Friend: 32.99% obtained them from family or friends.
    - Online: 15.46% reported obtaining antibiotics online.

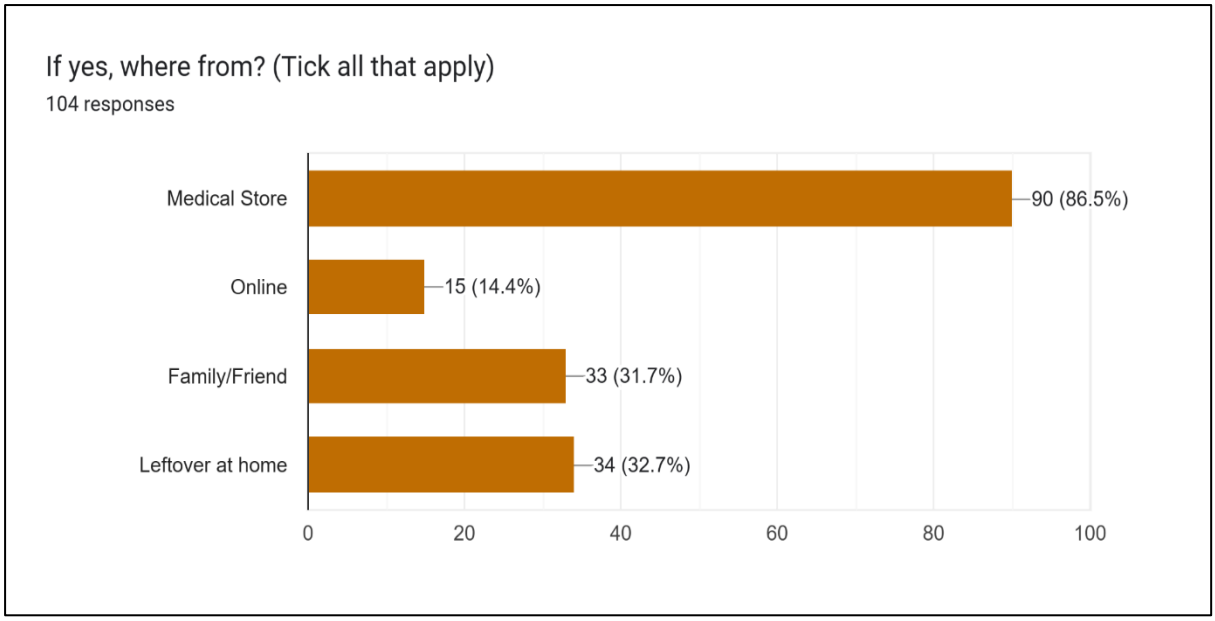


Fig 23.

4.6 Sources of Information

The data is based on **136 total selections** (respondents could choose more than one option), revealing a **mixed media and interpersonal communication** landscape for public health messaging.

The **most trusted and utilized source** of AMR information was **healthcare professionals**, with **51.5% of respondents indicating they had heard about AMR from a health worker or doctor**. This represents the important role of medical professionals in educating the public and suggests that interventions leveraging doctor-patient interactions could have significant impact.

Close behind, **47.1% of participants reported receiving information through pharmacies**. Given the OTC use of antibiotics in India and the frequent community interaction with pharmacists, this finding reinforces the importance of involving pharmacists in AMR awareness campaigns. Pharmacies serve as **frontline information points** in the community and can be powerful partners in promoting responsible antibiotic use.

Mass media also played a noticeable role, with **35.3% reporting exposure through TV, radio, or newspapers**. These channels continue to offer broad reach and are essential for structured public awareness campaigns. Interestingly, **30.1% of respondents cited social media** as a source of AMR information, reflecting the increasing digital engagement of the public and the

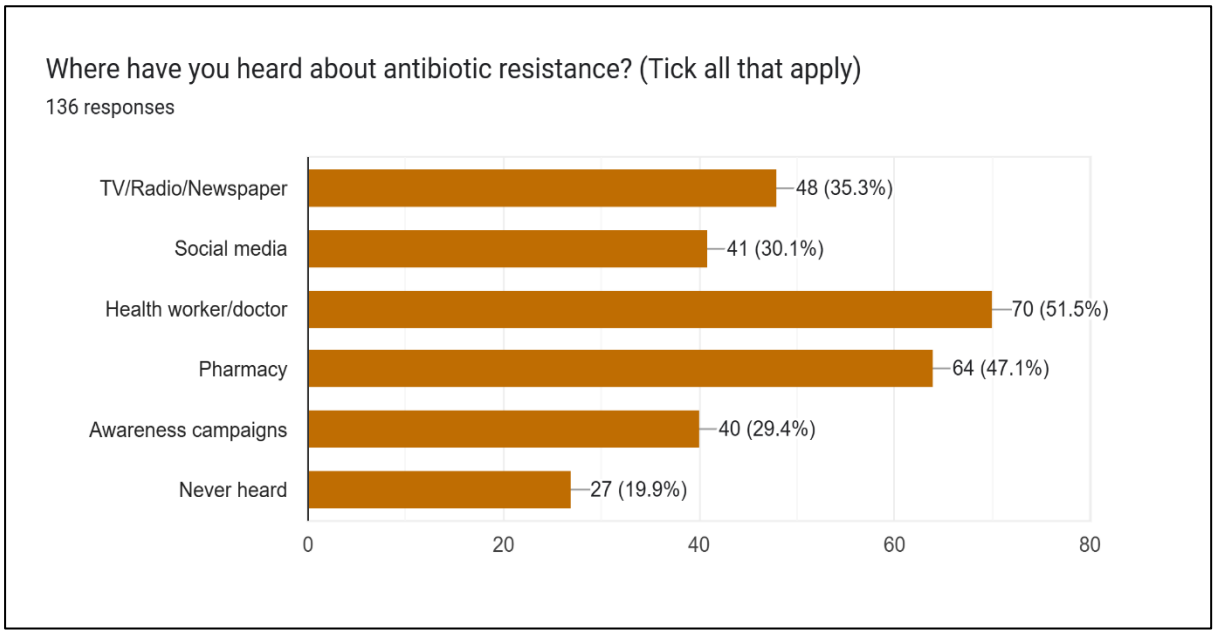
importance of curating accurate, accessible content on platforms like WhatsApp, Instagram, and Facebook.

However, only **29.4% mentioned awareness campaigns** specifically, indicating either limited reach of such initiatives or poor recall of campaign branding. This suggests that either the frequency, visibility, or effectiveness of public awareness efforts could be improved through better design, repetition, and integration into trusted local contexts.

Alarmingly, **19.9% of respondents said they never hear about AMR**. This nearly one-fifth proportion reflects a **serious information gap** within the community, pointing to a lack of access or exclusion from formal and informal health communication streams. These individuals may be at the highest risk for antibiotic misuse due to a complete lack of awareness and must be a **priority target group** in future interventions.

In summary, the findings emphasize that while healthcare professionals and pharmacies are key AMR information providers, **mass media, social media, and public campaigns need reinforcement and coordination**. Moreover, addressing the knowledge gap among those completely unaware of AMR is essential for achieving comprehensive public health impact.

Fig 24.



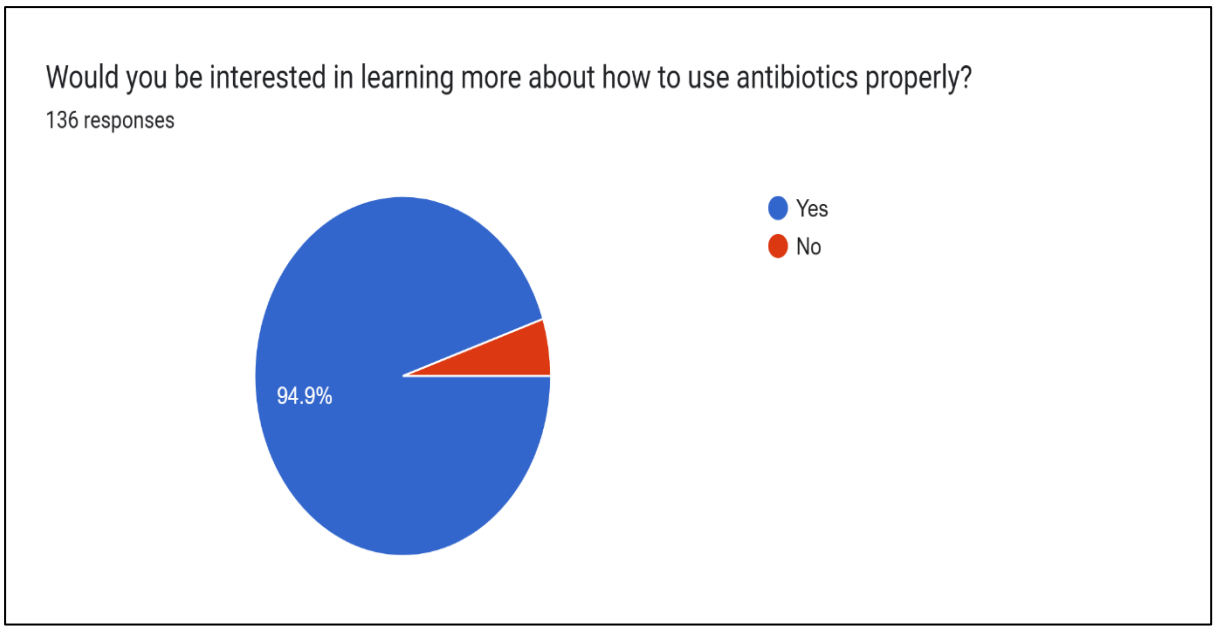


Fig 25.

Out of 136 responses, a significant number of participants (67.6%) acknowledged that maintaining good hygiene and getting vaccinated can really help cut down on the spread of infections, which in turn reduces the need for antibiotics. This shows that there's a pretty solid awareness among the public about how important these preventive measures are in tackling antimicrobial resistance (AMR). Simple hygiene practices—like washing hands regularly, handling food safely, and keeping things clean—play a crucial role. Vaccinations also help prevent bacterial diseases (such as pneumococcal infections) and viral illnesses, which are sometimes wrongly treated with antibiotics, leading to misuse.

On the flip side, 11.8% of respondents didn't think that hygiene and vaccination have any impact on reducing antibiotic use. This group seems to reflect some misconceptions or a lack of understanding about how infection control works. They might not realize that by reducing the number of diseases through good hygiene and immunization, we actually lessen the need for treatments like antibiotics.

Moreover, 20.6% of respondents were unsure, pointing to a significant gap in information. This uncertainty could stem from limited health education or exposure to mixed health messages. It suggests that many people might not fully grasp the indirect connection between prevention and resistance, and they may not see how everyday preventive actions tie into larger public health objectives.

In summary, while most people get the connection between prevention and reduced reliance on antibiotics, there's still a notable portion of the population that is either misinformed or simply unaware. This underscores the need for stronger public health messaging, especially highlighting the value of basic hygiene and routine vaccinations as effective, community-wide strategies to combat the rise and spread of antimicrobial resistance. Public awareness campaigns should focus on closing these gaps by clearly illustrating how preventing infections can ease the strain on healthcare systems and slow down the emergence of resistant pathogens.

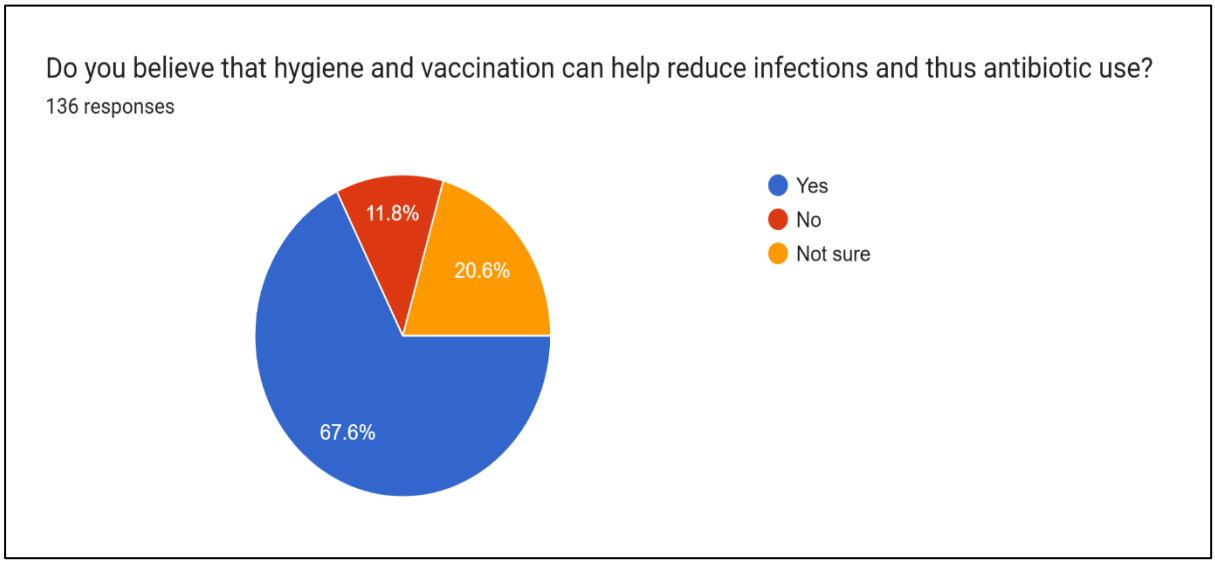


Fig 26.

Chapter 5: Discussion

This chapter dives into the preliminary findings shared in Chapter 4, placing them within the broader context of existing literature on antimicrobial resistance (AMR) and public health. The goal here is to explore the implications of the observed knowledge, attitudes, and practices (KAP) among the population in Pune, point out the limitations of the current study, and suggest avenues for future research.

5.1 Key Findings

The initial analysis of 136 responses uncovers several important insights into how the general public in Pune understands and behaves regarding AMR:

- **High Awareness but Persistent Misconceptions:** A significant majority (85.53%) of respondents indicated they had heard of AMR, suggesting that awareness campaigns are making an impact. However, despite this reported awareness and a fairly high average knowledge score (4.05 out of 6), some misconceptions still linger. For example,

while most people correctly recognized that antibiotics don't work against viral infections and that resistance can harm the environment, a worrying number still thought it was okay to stop taking antibiotics early or that using them without a prescription was safe. These subtle gaps indicate that while awareness exists, it often lacks a deeper understanding of the mechanisms and consequences of resistance.

- **Widespread Misuse Practices:** A troubling finding is the high rate of behaviors that contribute to antibiotic misuse. More than two-thirds (68.42%) admitted to purchasing antibiotics without a prescription. Additionally, a significant portion didn't always finish their full course (32.9%) and often kept leftover antibiotics (59.21%) or shared them with others (52.63%). These statistics highlight a stark disconnect between what people know or believe and their actual behaviors, showing that individuals frequently engage in practices that exacerbate AMR, even when they understand the seriousness of the issue.

- **Accessibility through Pharmacies:** Medical stores have become the go-to option for many, with a striking 90.38% of people obtaining antibiotics without a prescription. This situation underscores a vital area where we really need to step up regulatory actions and enforcement regarding how medications are dispensed.

- **Perception of Seriousness and Responsibility:** A large portion of respondents, about 80.26%, recognized antimicrobial resistance (AMR) as a serious concern in India and believed that antibiotics are being overprescribed (80.26%). Most felt that the responsibility for addressing AMR lies primarily with doctors, pharmacists, and the government, while around half of the respondents also acknowledged their own part in the issue. This collective awareness suggests a readiness to get involved if specific measures are introduced.

- **Lack of Significant Association between Knowledge and Practice:** Interestingly, the initial findings didn't show a strong connection between higher knowledge levels and reduced antibiotic misuse ($p=0.566$). Similarly, there was no significant correlation between education level and knowledge ($p=0.132$), or between education level and responsible antibiotic use. If these results hold true with a larger sample, it implies that simply increasing knowledge might not be enough to change long-standing behaviors. Other factors, like convenience, cost, cultural norms, trust in unofficial sources, or the

perceived severity of the illness, could play a more crucial role in how antibiotics are used.

5.2 Comparison with Literature

The findings from this initial study both resonate with and diverge from existing literature on AMR knowledge, attitudes, and practices (KAP), particularly studies from the WHO and other international organizations, as well as those conducted within India.

- **Keeping Up with Global Trends:** There's a notable level of awareness about Antimicrobial Resistance (AMR), but it's often mixed with misunderstandings—like the belief that antibiotics can treat viral infections or that it's okay to stop treatment early. This mirrors what was found in the WHO Multi-country Public Awareness Survey back in 2015. That report highlighted similar knowledge gaps, even as people acknowledged the seriousness of the issue. The fact that many view AMR as a significant concern aligns with findings from various Eurobarometer surveys throughout the EU, showing a widespread sense of worry.
- **Reflecting the Indian Context:** The high rates of using antibiotics without prescriptions and not completing courses in Pune reflect broader trends seen across India. It's well-known that India is a major consumer of antibiotics, with over-the-counter sales being quite common (Government of India, 2017). Many studies in India have shown that people often rely on medical stores for antibiotics without prescriptions, highlighting the difficulties in enforcing prescription-only sales.
- **Knowledge vs. Practice Discrepancy:** Interestingly, this initial sample didn't show a strong link between knowledge and actual practice (like misuse), which is a bit different from some studies that suggest a positive relationship. For instance, some Knowledge, Attitude, and Practice (KAP) studies indicate that more knowledge leads to more responsible use. However, other research, especially from low- and middle-income countries, often points to a "knowledge-practice gap," where knowing the right thing doesn't always mean doing it, often due to systemic, economic, or social barriers. The findings here might lean towards this latter view, suggesting that just having knowledge isn't enough to change behavior, especially when easier but incorrect options (like buying over-the-counter) are available. The results from Shahpawee et al. (2020) and Leal et al. (2022) regarding university students, while revealing some misconceptions, also showed a willingness to learn, which could play a role in shaping future behaviors.

5.3 Public Health Implications

The initial findings have important implications for public health in the fight against antimicrobial resistance (AMR) in Pune and possibly in other urban areas across India:

- **Need for Targeted Awareness Programs:** While people generally know about AMR, awareness campaigns should go beyond just informing the public. They need to tackle specific misunderstandings about how antibiotics work against viruses, the importance of completing prescribed courses, and the risks associated with self-medication and sharing medications. Educational efforts should focus on explaining the reasons behind responsible antibiotic use, making the concept of resistance development easy to understand.
- **Stricter Regulation of OTC Antibiotic Sales:** The heavy dependence on medical stores for non-prescription antibiotics calls for immediate and strict regulatory measures. We need to ensure that pharmacies follow prescription-only policies. This could involve regular audits, penalties for those who don't comply, and awareness campaigns to educate the public about the risks of purchasing antibiotics without consulting a doctor.
- **Empowering the Public with Actionable Knowledge:** It's encouraging that many people feel a sense of responsibility and believe they can contribute to stopping AMR. Public health strategies should build on this by providing individuals with clear, actionable steps they can take, such as always consulting a doctor, avoiding self-medication, and safely disposing of leftover medications.

- **Multi-Sectoral Approach:** The "One Health" concept, which many respondents recognize, needs to be actively incorporated into public health strategies. This means involving not just healthcare professionals but also pharmacists, government agencies, agricultural sectors, and environmental organizations in a united effort to combat AMR.
- **Behavioral Economics and Nudging:** Considering the potential gap between knowledge and practice, future initiatives might benefit from applying principles of behavioral economics to gently encourage individuals toward more responsible behaviors.

5.4 Limitations

- **Small Sample Size:** One of the biggest drawbacks here is the sample size, which stands at just 136 respondents—far below the target of 350. This limited number makes it tough to generalize the findings to the broader population of Pune. More importantly, it hampers our ability to detect real connections between different variables. The non-significant p-values linking education/knowledge to misuse might not indicate a true lack of association; they could simply be a result of not having enough power in the study.
- **Self-Reported Data:** The study relies on self-reported data collected through questionnaires, which can introduce social desirability bias. Respondents might be inclined to exaggerate their responsible behaviors and downplay any misuse, leading to a potential underestimation of how often antibiotics are used inappropriately.
- **Cross-sectional Design:** Since this is a cross-sectional study, it only provides a snapshot at one moment in time and can't establish cause-and-effect relationships. For example, it can't definitively say that a lack of knowledge leads to misuse; it can only show that these two factors might be related in some way.
- **Limited Scope:** The research is focused solely on Pune, which means the findings may not be directly applicable to other urban or rural areas in India that have different socio-economic and cultural backgrounds.
- **Questionnaire Depth:** Although the questionnaire was adapted from WHO guidelines, it may not have fully captured the complexities of individual decision-making or the various factors that influence antibiotic use.

5.5 Suggestions for Future Research

- **Expand Sample Size:** The next logical step is to continue data collection until we reach that target of 350 respondents. A larger sample will enhance the statistical power of the study, allowing for more reliable conclusions about the relationships between variables and improving how well we can generalize the findings.
- **Longitudinal Design:** Future research could really benefit from a longitudinal study design to monitor how knowledge, attitudes, and practices (KAP) evolve over time,

especially after rolling out specific awareness campaigns or policy changes. This approach would help us assess causality and see how effective these interventions are.

- **Mixed-Methods Approach:** By blending various research methods, we could gain richer insights into the attitudes, beliefs, and socio-cultural factors that contribute to antibiotic misuse, particularly regarding the knowledge-practice gap we've observed. This would help us understand the reasons behind people's behaviors, going beyond what traditional surveys can reveal.
- **Interventional Community Programs:** Future studies might focus on designing and evaluating targeted community-based interventions—like educational workshops, public service campaigns that tackle specific misconceptions, and training for community pharmacists—to enhance KAP and curb inappropriate antibiotic use.
- **Healthcare Provider Perspectives:** Additional research could look into the KAP of healthcare providers, such as doctors and pharmacists, in Pune regarding their antibiotic prescribing and dispensing practices, as well as their views on public knowledge. This could help pinpoint discrepancies and common challenges they face.
- **Economic Impact of AMR:** Future studies could explore how households and healthcare systems perceive the economic burden of antimicrobial resistance (AMR), as this could serve as a strong motivator for changing behaviors.

Chapter 6: Conclusion & Recommendations

6.1 Conclusion

The preliminary findings from the study, which involved 136 respondents in Pune, provide valuable insights into the current state of AMR. The study concludes that while there is a high level of general awareness about AMR among the urban population in Pune, this awareness often comes with significant misconceptions about how antibiotics work, the mechanisms of resistance, and the proper use of antibiotics. Importantly, the study found a widespread occurrence of antibiotic misuse practices, such as buying antibiotics without a prescription, not completing treatment courses, keeping leftover medications, and sharing them with others.

- A key takeaway here is the noticeable gap between what people know and what they actually do. Even though most folks recognize how serious antimicrobial resistance

(AMR) is and believe they have a role in fighting it, many still engage in habits that contribute to the problem.

- This survey shows that only providing knowledge about the antimicrobial resistance is not enough. Additionally, that alone will not bring about a change in people's behavior. There is easy access to antibiotics without the prescriptions and are also easily available, and there is no immediate risk associated with the use of the same. This is the reason why people are not aware of the risks of taking antibiotics and there is no fear among the people.
- With the help of initial analysis there was no formal link between higher knowledge or education levels and a more responsible antibiotic use. This highlights the knowledge-practice gap. There is widespread availability of antibiotics through informal channels, majorly at medical stores, is recognized as a greatest problem in this battle against AMR.
- In short we can say that, while awareness about AMR is there in considerable amount in Pune, there's still lot of scope for illegal practices to continue. Combating this complex problem is required. And for that we need to go beyond just raising general awareness and focus on targeted, actionable strategies that address specific misconceptions, to regulate how drugs are dispensed in pharmacies, and show people the practical steps for good antibiotic use.

6.2 Recommendations

Based on the findings and conclusions of this study, there are some recommendations to strengthen this fight against antimicrobial resistance in Pune and in urban areas in India:

1. **Public Awareness Campaigns with a Specific Behavioral Focus:**
2. **Transition from general awareness to targeted education:** There should be campaigns for not only educating but for proper guidance on how to restrict antibiotic use. There should be a limit on antibiotic use. The messages should include:
    - "Antibiotics are ineffective for colds, flu, and most sore throats."
    - "Always finish the entire course of antibiotics, even if you start feeling better."
    - "Never use leftover antibiotics or share them with others."
    - "Always consult a qualified doctor before taking antibiotics."

3. **Use different communication channels:** Use different media channels such as mass media, newspapers, TV, and social media platforms to educate the public.
4. **Keep it simple and memorable:** It is important to use clear language and be straightforward when educating the public about antibiotic use. Use examples and images to educate the public. It will help people to understand the information and remember it.
5. **Foster Responsible Antibiotic Stewardship among Patients:**
    a. Encourage patients to ask their doctors whether an antibiotic is really necessary for their condition and to understand the reasons behind the specific antibiotic prescribed and its duration.
    b. Offer clear guidance on how to properly dispose of unused or expired antibiotics to keep them out of the environment.
6. **Support Further Research with Larger Samples and Mixed Methods:**
    a. **Complete the current study's target sample size:** Our top priority right now is to gather more data. This will help us strengthen our findings and enable a more thorough statistical analysis, especially when it comes to understanding associations.
    b. **Conduct qualitative studies:** We should dive into qualitative research, like focus group discussions, to really get to the heart of the motivations, beliefs, and barriers that lead to inappropriate antibiotic use. This is particularly important for addressing the knowledge-practice gap. Insights from this research can guide us in creating more tailored and effective behavioral change interventions.
    c. **Evaluate interventions:** It's crucial that we focus on assessing the impact of specific educational and regulatory interventions on public knowledge, attitudes, and practices (KAP), with the ultimate goal of reducing antibiotic resistance rates.

References:

1. Centers for Disease Control and Prevention (CDC). Antibiotic/Antimicrobial Resistance [Internet]. Atlanta: CDC; 2023 [cited 2025 May 23]. Available from: https://www.cdc.gov/drugresistance/index.html

2. Government of India. National Action Plan on Antimicrobial Resistance [Internet]. New Delhi: Directorate General of Health Services, Ministry of Health & Family Welfare; 2017 [cited 2025 May 23]. Available from: https://ncdc.gov.in/WriteReadData/l892s/File622.pdf

3. Leal HF, de Moura JF, Macfarlane BJ. Survey on antimicrobial resistance knowledge and perceptions in university students. J Antibiot Antimicrob Resist. 2022;4(1):1–12.

4. Shahpawee NS, Chin PS, Abdul Rahman Z, Chin VK. University students' antibiotic use and antimicrobial resistance knowledge: A cross-sectional study. Antibiotics (Basel). 2020;9(12):856. Available from: https://doi.org/10.3390/antibiotics9120856

5. World Health Organization. Antibiotic Resistance: Multi-country Public Awareness Survey [Internet]. Geneva: WHO Press; 2015 [cited 2025 May 23]. Available from: https://www.who.int/publications/i/item/9789241509893

6. World Health Organization. Global Action Plan on Antimicrobial Resistance [Internet]. Geneva: WHO Press; 2015 [cited 2025 May 23]. Available from: https://www.who.int/publications/i/item/9789241509763

7. Ahmed SK, Hussein S, Qurbani K, Ibrahim RH, Fareeq A, Mahmood KA, Mohamed MG. Antimicrobial resistance: Impacts, challenges, and future prospects. J Med Surg Public Health. 2024;2:100081. Available from: https://doi.org/10.1016/j.glmedi.2024.100081

8. Prestinaci F, Pezzotti P, Pantosti A. Antimicrobial resistance: a global multifaceted phenomenon. Pathog Glob Health. 2015;109(7):309–18. Available from: https://doi.org/10.1179/2047773215Y.0000000030

9. Salam MA, Al-Amin MY, Salam MT, Pawar JS, Akhter N, Rabaan AA, Alqumber MAA. Antimicrobial resistance: A growing serious threat for global public health. Healthcare (Basel). 2023;11(13):1946. Available from:https://doi.org/10.3390/healthcare11131946

10. Zhou ZC, Liu Y, Lin ZJ, Shuai XY, Zhu L, Xu L, et al. Spread of antibiotic resistance genes and microbiota in airborne particulate matter, dust, and human airways in the urban hospital. Environ Int. 2021;153:106501. doi: 10.1016/j.envint.2021.106501

11. Zhu D, Giles M, Yang XR, Daniell T, Neilson R, Zhu YG. Phyllosphere of staple crops under pig manure fertilization, a reservoir of antibiotic resistance genes. Environ Pollut. 2019;252:227–35. doi: 10.1016/j.envpol.2019.05.098

12. Yusuf E, Bax HI, Verkaik NJ, van Westreenen M. An update on eight "new" antibiotics against multidrug-resistant gram-negative bacteria. J Clin Med. 2021;10(5):1068. doi: 10.3390/jcm10051068

13. Yahia HB, Chairat S, Hamdi N, Gharsa H, Sallem RB, Ceballos S, et al. Antimicrobial resistance and genetic lineages of faecal enterococci of wild birds: emergence of vanA and vanB2 harbouring Enterococcus faecalis. Int J Antimicrob Agents. 2018;52(6):936–41. doi: 10.1016/j.ijantimicag.2018.05.005

14. Yadav V, Ravichandran S. Significance of understanding the genomics of host-pathogen interaction in limiting antibiotic resistance development: lessons from COVID-19 pandemic. Brief Funct Genomics. 2024;23(1):69–74. doi: 10.1093/bfgp/elad001

15. Xu C, Wei X, Jin Y, Bai F, Cheng Z, Chen S, et al. Development of resistance to Eravacycline by Klebsiella pneumoniae and collateral sensitivity-guided design of combination therapies. Microbiol Spectr. 2022;10(2):e01390–22. doi: 10.1128/spectrum.01390-22

16. White A, Hughes JM. Critical importance of a one health approach to antimicrobial resistance. EcoHealth. 2019;16(3):404–9. doi: 10.1007/s10393-019-01415-5

17. Wegener HC. Antibiotic resistance—linking human and animal health. In: Improving food safety through a one health approach: Workshop summary. Washington (DC): National Academies Press; 2012. p. 331.

18. Naghavi M, et al. Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050. Lancet. 2024;404(10459):1199–1226.

19. Kumar SG, Adithan C, Harish BN, Sujatha S, Roy G, Malini A. Antimicrobial resistance in India: A review. J Nat Sci Biol Med. 2013;4(2):286–91. doi: 10.4103/0976-9668.116970

20. Founou RC, Blocker AJ, Noubom M, Tsayem C, Choukem SP, van Dongen M, et al. The COVID-19 pandemic: a threat to antimicrobial resistance containment. Future Sci OA. 2021;7(8):FSO736. doi: 10.2144/fsoa-2021-0012

21. Prestinaci F, Pezzotti P, Pantosti A. Antimicrobial resistance: a global multifaceted phenomenon. Pathog Glob Health. 2015;109(7):309–18. doi: 10.1179/2047773215Y.0000000030

22. Llor C, Bjerrum L. Antimicrobial resistance: risk associated with antibiotic overuse and initiatives to reduce the problem. Ther Adv Drug Saf. 2014;5(6):229–41. doi: 10.1177/2042098614554919

23. Tembo N, Mudenda S, Banda M, Chileshe M, Matafwali S. Knowledge, attitudes and practices on antimicrobial resistance among pharmacy personnel and nurses at a tertiary hospital in Ndola, Zambia: implications for antimicrobial stewardship programmes. JAC Antimicrob Resist. 2022;4(5):dlac107. doi: 10.1093/jacamr/dlac107

24. Dopelt K, Amar A, Yonatan N, Davidovitch N. Knowledge, attitudes, and practices regarding antibiotic use and resistance: a cross-sectional study among students in Israel. Antibiotics (Basel). 2023;12(6):1028. doi: 10.3390/antibiotics12061028

25. Ndagire R, Obuku EA, Segawa I, et al. Knowledge, attitude, and practices regarding antibiotic use and antimicrobial resistance among urban slum dwellers in Uganda. Antimicrob Resist Infect Control. 2025;14:12. doi: 10.1186/s13756-025-01517-6

26. Singhal T. Antimicrobial resistance: the 'other' pandemic!. Indian J Pediatr. 2022;89(6):600–6. doi: 10.1007/s12098-021-04008-9

27. Nair M, Zeegers MP, Varghese GM, Burza S. India's National Action Plan on Antimicrobial Resistance: a critical perspective. J Glob Antimicrob Resist. 2021;27:236–8. doi: 10.1016/j.jgar.2021.10.007

28. Sharma A, Thakur N, Thakur A, et al. The challenge of antimicrobial resistance in the Indian healthcare system. Cureus. 2023;15(7):e42231. doi: 10.7759/cureus.42231

29. Singer AC, Shaw H, Rhodes V, Hart A. Review of antimicrobial resistance in the environment and its relevance to environmental regulators. Front Microbiol. 2016;7:1728.

30. Ganguly NK, Arora NK, Chandy SJ, et al. Rationalizing antibiotic use to limit antibiotic resistance in India. Indian J Med Res. 2011;134:281–94.

31. Kotwani A, Chaudhury RR, Holloway K. Antibiotic-prescribing practices of primary care prescribers for acute diarrhea in New Delhi, India. Value Health. 2012;15:S116–9.

32. United Nations. Draft political declaration of the high-level meeting of the General Assembly on antimicrobial resistance [Internet]. Available from: http://www.un.org/pga/71/wp-content/uploads/sites/40/2016/09/DGACM_GAEAD_ESCAB-AMRDraft-Political-Declaration-1616108E.pdf

33. G7 Health Ministers. Berlin Declaration on Antimicrobial Resistance. 2015 [Internet]. Available from: http://www.g8.utoronto.ca/healthG8/2015-berlin.html

34. Ajayi AO, Odeyemi AT, Akinjogunla OJ, et al. Review of antibiotic-resistant bacteria and antibiotic resistance genes within the one health framework. Infect Ecol Epidemiol. 2024;14(1). doi: 10.1080/20008686.2024.2312953

35. Sweileh WM, Moh'd Mansour A. Bibliometric analysis of global research output on antimicrobial resistance in the environment (2000–2019). Glob Health Res Policy. 2020;5(1). doi: 10.1186/s41256-020-00165-0

36. de Carvalho FM, Valiatti TB, Santos FF, et al. Exploring the bacteriome and resistome of humans and food-producing animals in Brazil. Microbiol Spectr. 2022;10(5). doi: 10.1128/spectrum.00565-22

37. Gwenzi W, Shamsizadeh Z, Gholipour S, et al. The air-borne antibiotic resistome: occurrence, health risks, and future directions. Sci Total Environ. 2022;804:150154. doi: 10.1016/j.scitotenv.2021.150154

Questionnaire: Knowledge, Attitudes, and Practices on Antimicrobial Resistance (AMR)

Instructions for Completing the Survey

The survey consists of 25–30 short questions and will take about 15–20 minutes to complete.

Please read each question carefully and choose the most appropriate response.

There are no right or wrong answers—we are only interested in your honest opinions and experiences.

We sincerely appreciate your time and contribution.

Thank you for helping us in the fight against antibiotic resistance!

Warm regards,

Atharva Suryawanshi

Principal Investigator

IIHMR University

Email/Contact No: atharva.pm15@iihmr.in / 8806491578

1. Name

2. Age in years

3. Gender
   - Male
   - Female
   - Other

4. Education level
   - Illiterate

- Primary
- Secondary
- Higher Secondary
- Graduate
- Post graduate
- Occupation

5. Monthly household income
   - < Rs. 10,000
   - Rs. 10,000 - Rs. 30,000
   - Rs. 30,001 - Rs. 60,000
     - Rs. 60,000

6. Residential area
   - Urban Pune
   - Rural/Periurban area
   - Out of Pune Resident

7. Have you heard about the term "antimicrobial resistance (AMR)" or "antibiotic resistance"?
   - Yes
   - No

8. Antibiotics can cure viral infections like cold and flu.
   - True
   - False
   - Don't know

9. Antibiotic resistance happens when bacteria become resistant to antibiotics.
   - True
   - False
   - Don't know

10. If I feel better, I can stop taking antibiotics.
    - True
    - False
    - Don't know
11. Taking antibiotics without a prescription is safe.
    - True
    - False
    - Don't know
12. Resistant bacteria can spread from person to person.
    - True
    - False
    - Don't know
13. Antibiotic resistance affects not only people but also animals and the environment.
    - True
    - False
    - Don't know
14. Do you think antibiotic resistance is a serious problem in India?
    - Yes
    - No
    - Not sure
15. Do you believe antibiotics are overused in our community?
    - Yes
    - No
    - Not sure
16. In your opinion, whose responsibility is it to prevent antibiotic resistance? (Tick all that apply)
    - Doctors
    - Patients
    - Government
    - Pharmacists
    - Me/the individual
    - Don't know
17. People like me can help stop antibiotic resistance.

- Agree
- Disagree
- Not sure

18. Have you taken antibiotics in the last 6 months?
    - Yes
    - No
19. If yes... What was the reason?

20. Did a doctor prescribe them?
    - Yes
    - No
21. Have you ever bought antibiotics without a prescription?
    - Yes
    - No
22. If yes, where from? (Tick all that apply)
    - Medical Store
    - Online
    - Family/Friend
    - Leftover at home
23. Do you complete the full course of antibiotics as prescribed?
    - Always
    - Sometimes
    - Never
24. Do you keep leftover antibiotics for future use?
    - Yes
    - No
25. Have you ever shared your antibiotics with someone else?
    - Yes
    - No
26. Where have you heard about antibiotic resistance? (Tick all that apply)
    - TV/Radio/Newspaper
    - Social media
    - Health worker/doctor

- Pharmacy
- Awareness campaigns
- Never heard

27. Would you be interested in learning more about how to use antibiotics properly?
    - Yes
    - No
28. Do you regularly wash your hands before eating or cooking?
    - Yes
    - No
    - Sometimes
29. Do you believe that hygiene and vaccination can help reduce infections and thus antibiotic use?
    - Yes
    - No
    - Not sure