Dissertation Project

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Overview

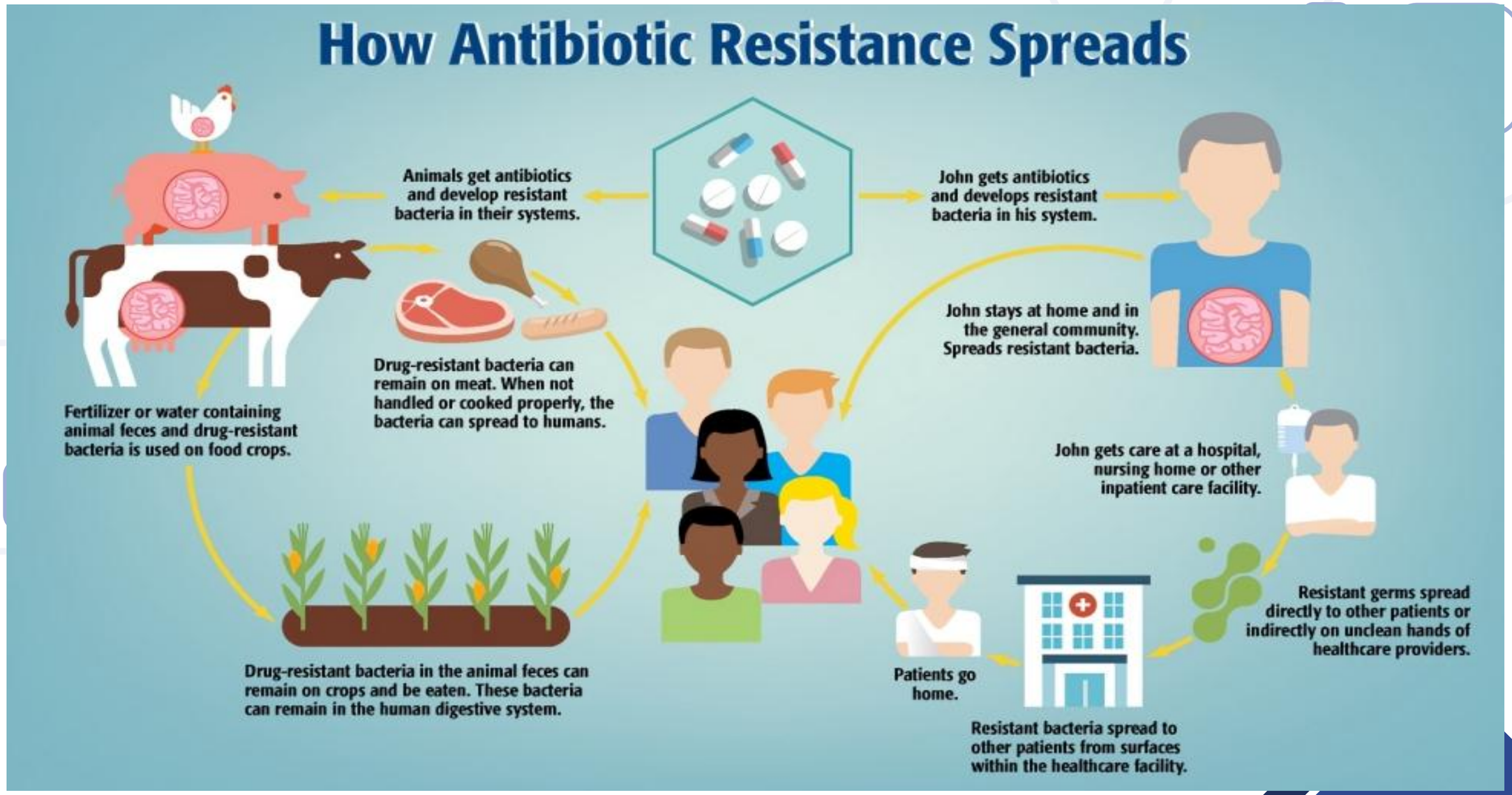
Abstract

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. In India, easy access to antibiotics, coupled with a lack of public understanding, contributes greatly to the coming AMR tsunami. Some of the additional, specific goals we had while conducting this study were to identify the sources from which the people in Pune obtain antibiotics. To determine if there is any association between various socio-demographic factors and how much people in Pune are misusing antibiotics.

Introduction

- This problem occurs when organisms, like fungi, viruses, parasites, and bacteria, develop many way to avoid the effects of antimicrobial drugs. Within these, antibiotic resistance is very much of concern, because of the lack of proper use of antibiotics in the environment.
- 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.
- 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.
- These habits not only diminish the effectiveness of antibiotics but also encourage the rise of multidrug-resistant organisms.

How Antibiotic Resistance Spreads



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.

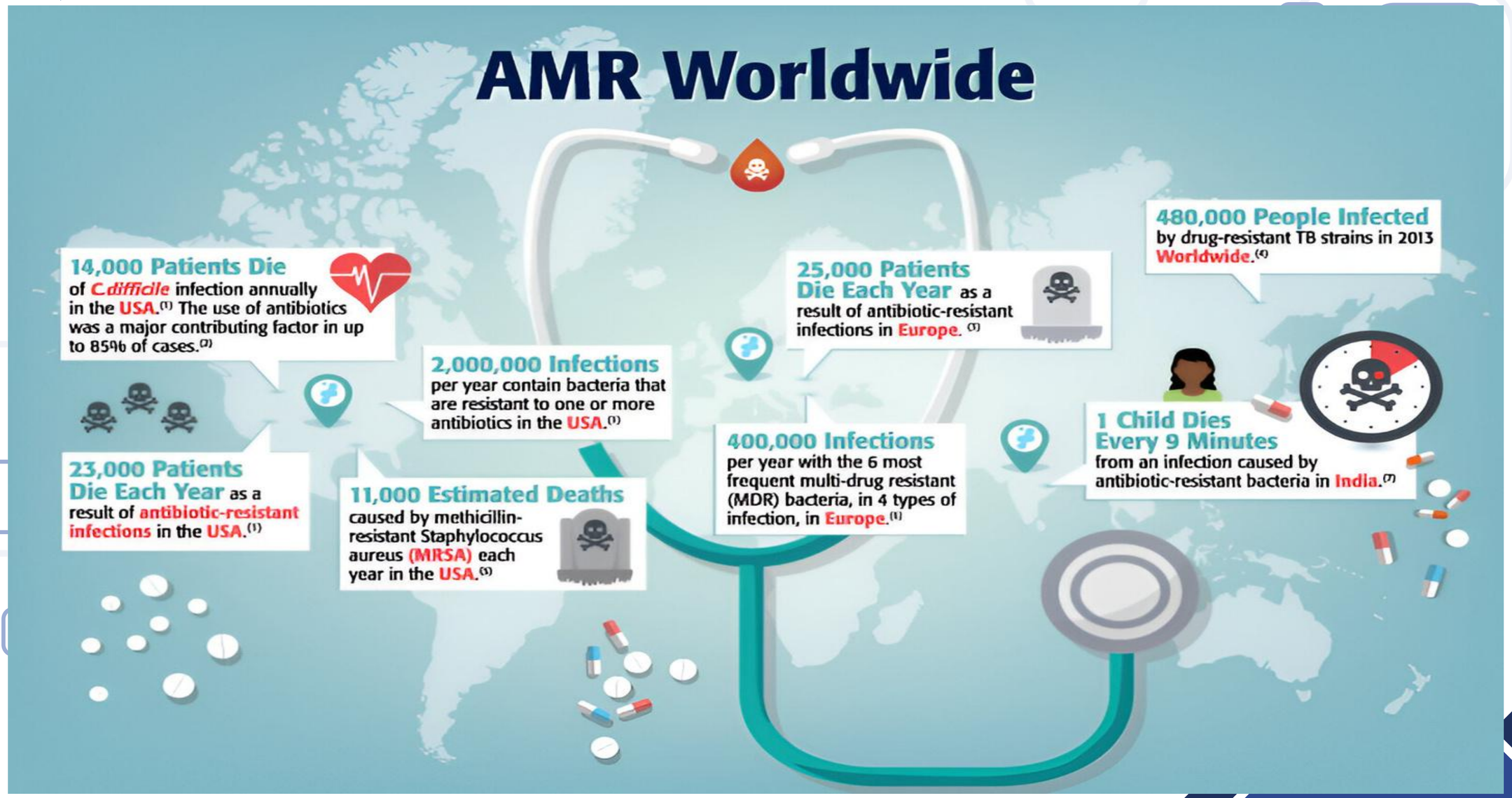
Primary Objective:

- 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 and in other states 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.

AMR Statistics Worldwide



Methodology

Study design

This study employs an observational, cross-sectional, and analytical research approach. A structured questionnaire is used for data collection, ensuring consistency and for doing quantitative analysis.

Population and sample

Total 136 responses were collected for the study. Individuals aged 18 and above. Questionnaire was prepared in English. Healthcare professionals (doctors, nurses, pharmacists) were excluded to avoid any expert bias.

Sampling method

- Area Cluster Method: Pune and its surrounding areas were divided in 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.

Sampling method

- 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.

Results

- 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.
- 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.
- 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.
- 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.

Results

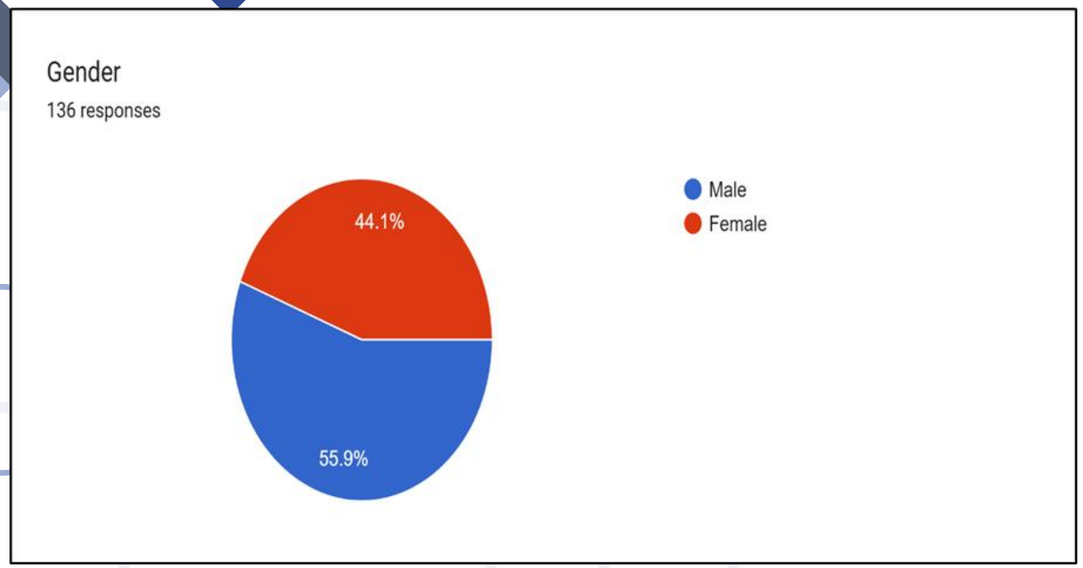
- A strong level of understanding was seen regarding self-medication, as 83.8% of respondents disagreed with the notion that taking antibiotics without a prescription is safe. Still, 14.7% held the dangerous belief that it is safe.
- When asked about transmission of resistant bacteria, 51.5% correctly 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.
- 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.

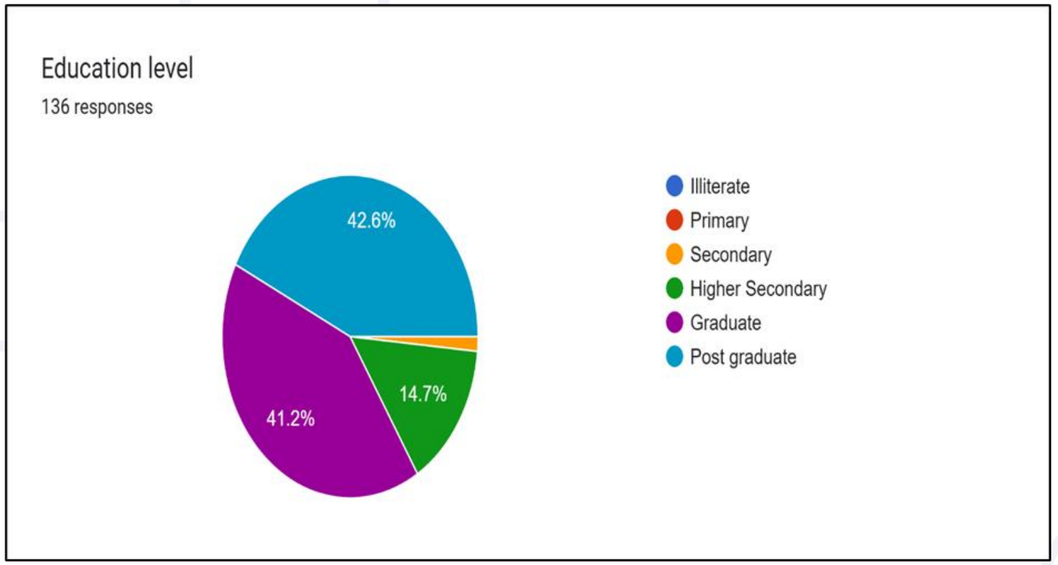
Results

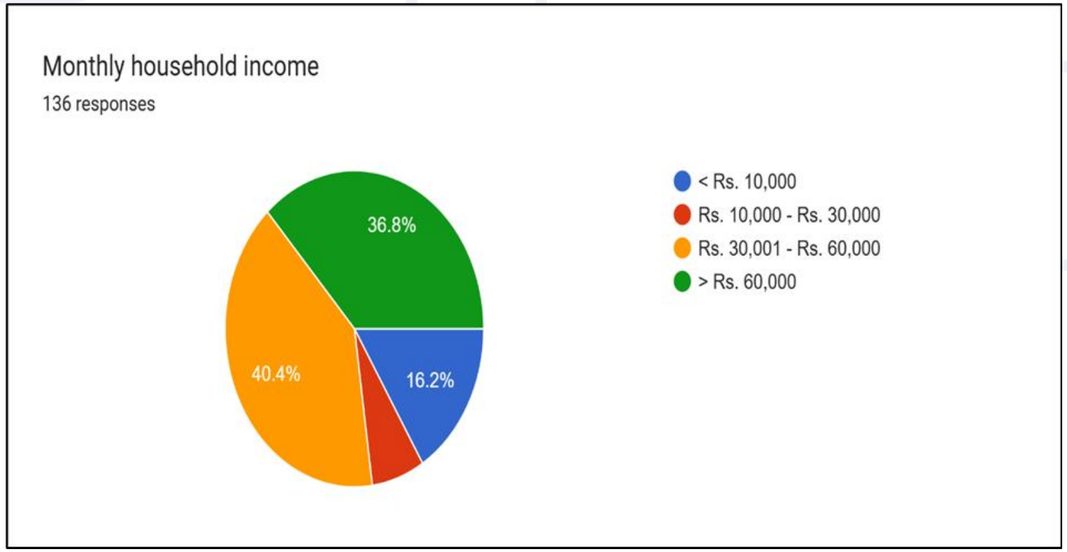
Attitudes

- **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.
- **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.
- **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.

Sample Characteristics



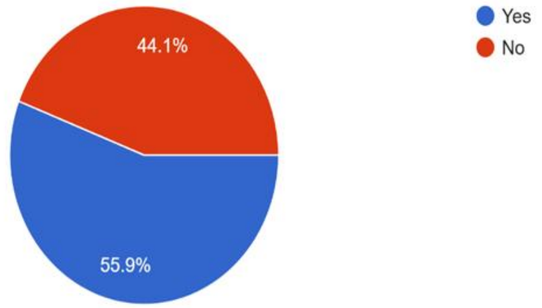




Results

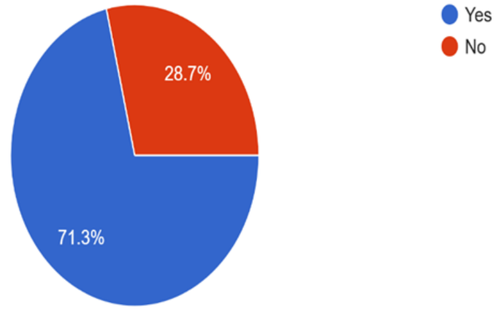
Have you ever shared your antibiotics with someone else?

136 responses



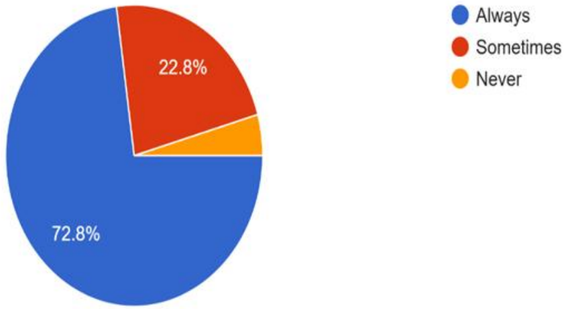
Have you ever bought antibiotics without a prescription?

136 responses



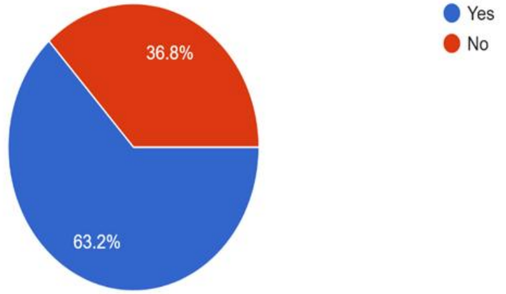
Do you complete the full course of antibiotics as prescribed?

136 responses



Do you keep leftover antibiotics for future use?

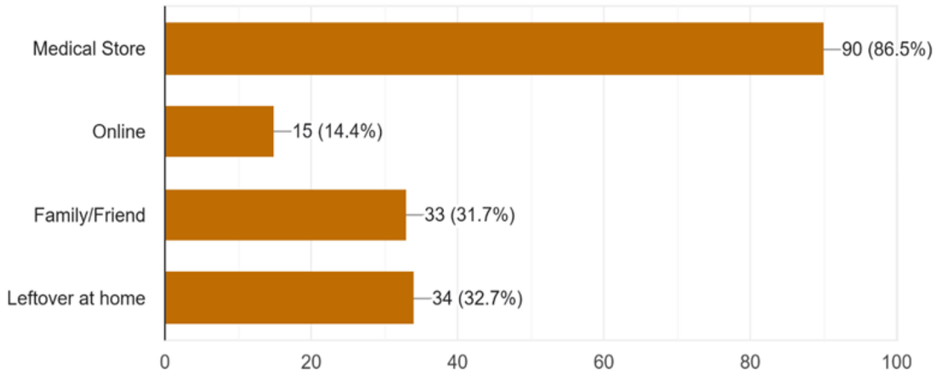
136 responses



Results

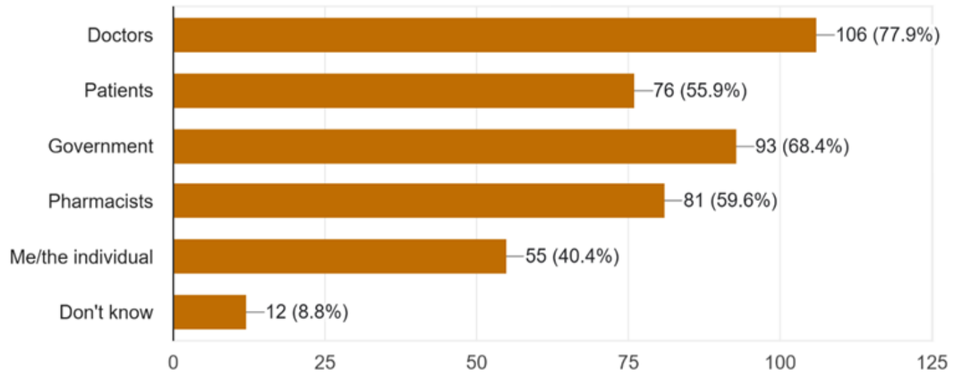
If yes, where from? (Tick all that apply)

104 responses



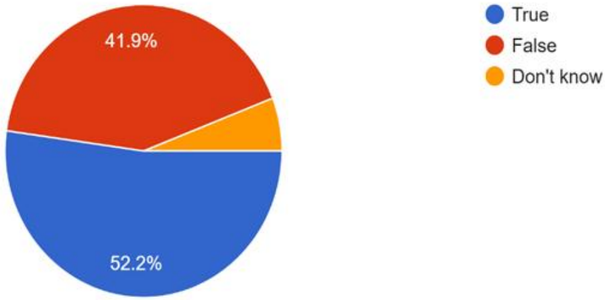
In your opinion, whose responsibility is it to prevent antibiotic resistance? (Tick all that apply)

136 responses



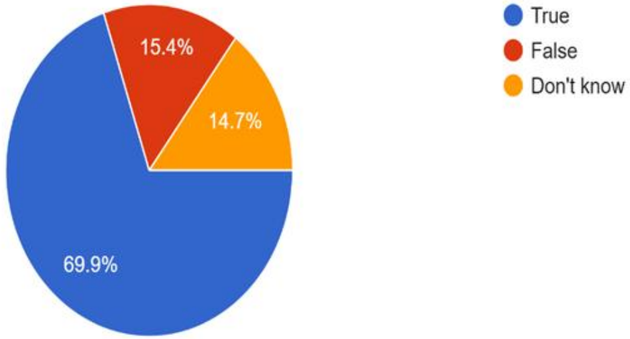
Antibiotics can cure viral infections like cold and flu.

136 responses



Antibiotic resistance happens when bacteria become resistant to antibiotics.

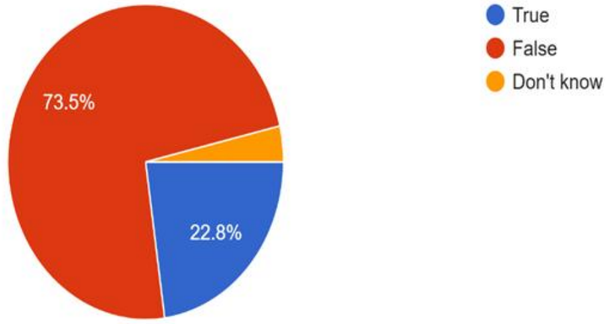
136 responses



Results

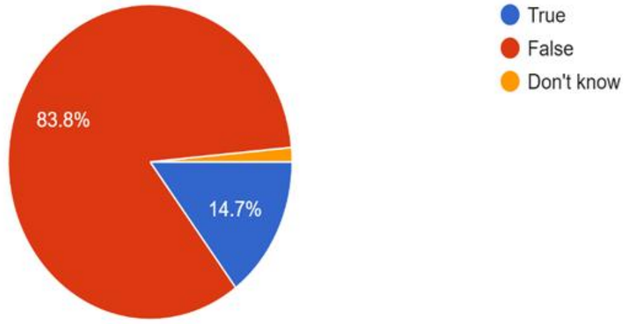
If I feel better, I can stop taking antibiotics.

136 responses



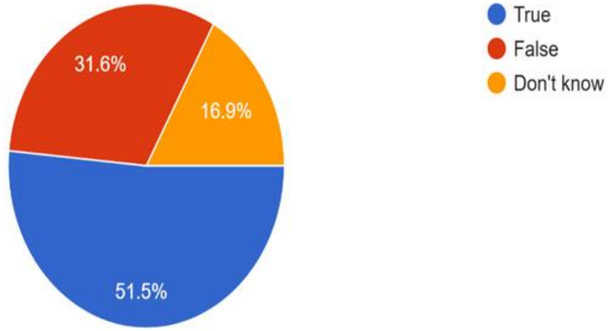
Taking antibiotics without a prescription is safe.

136 responses



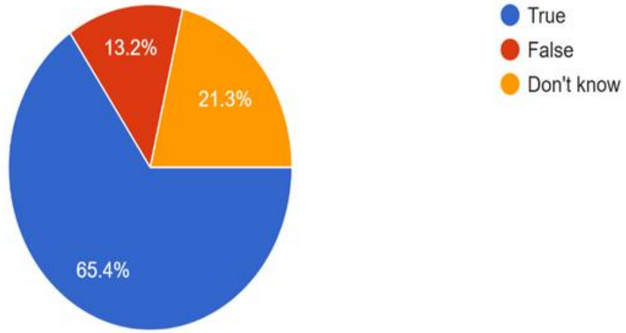
Resistant bacteria can spread from person to person.

136 responses



Antibiotic resistance affects not only people but also animals and the environment.

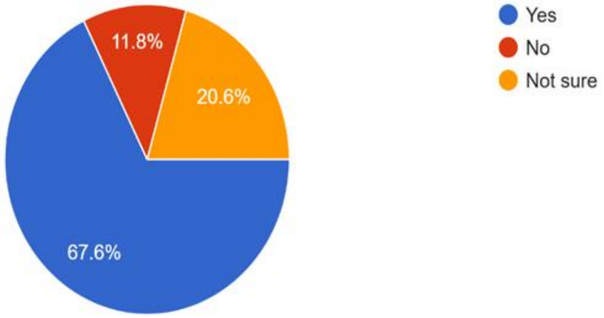
136 responses



Results

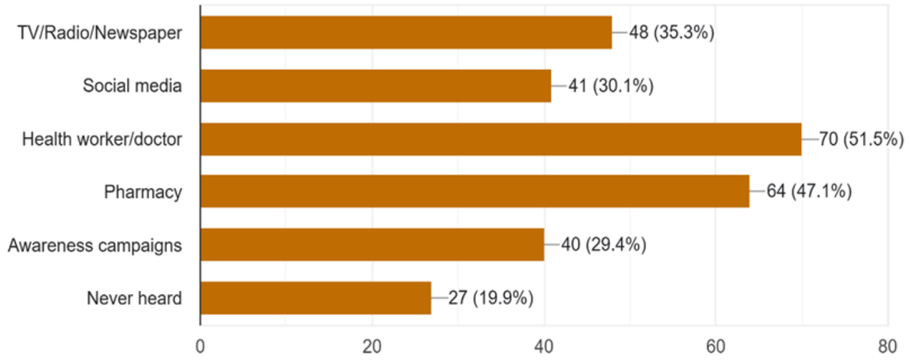
Do you believe that hygiene and vaccination can help reduce infections and thus antibiotic use?

136 responses



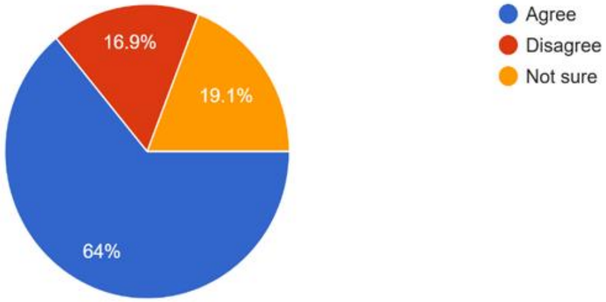
Where have you heard about antibiotic resistance? (Tick all that apply)

136 responses



People like me can help stop antibiotic resistance.

136 responses



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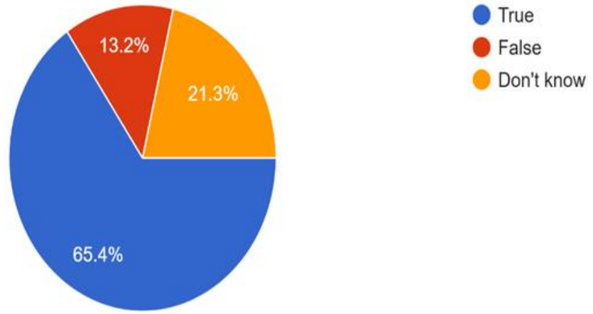

Key Findings

- **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.
- **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.

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.
- 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.

Conclusions

- A 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 risks 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.

Recommendations

- **Public Awareness Campaigns with a Specific Behavioral Focus**
- **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."
- **Use different communication channels:** Use different media channels such as mass media, newspapers, TV, and social media platforms to educate the public.
- **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.

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

References

1. 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

2. 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

3. 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

4. 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

5. 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

6. 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

7. 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.

8. 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.

9. 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

10. 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

Thank You