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A cross-sectional assessment of knowledge, attitude and practices towards antimicrobial resistance among the medical interns in Puducherry

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Abstract

The present study was conducted in Puducherry to assess the knowledge, attitude, and practices (KAP) related to antimicrobial resistance (AMR) among 200 medical interns, focusing on their future antimicrobial prescribing behaviour. A structured questionnaire consisting of 30 questions (10 each on knowledge, attitude, and practices) was administered. The findings revealed that 76% of interns were aware of superbugs, while only 28% were familiar with antimicrobial stewardship programs. Most respondents (96%) recognized that antibiotics can cause adverse effects, and 68% were aware that narrow-spectrum antibiotics contribute less to resistance. About 64% agreed that India may face an AMR crisis in the future, and 72% supported prescribing antimicrobials based on culture and sensitivity reports. However, only 36% believed that banning prophylactic antimicrobial use in food-producing animals could reduce AMR, while 68% were optimistic about the development of new antimicrobial classes. Notably, 88% acknowledged the combined role of medical and veterinary professionals in combating AMR. Regarding practices, 92% reported using antibiotics fewer than five times in the past year, yet 60% admitted to antibiotic use without consulting a doctor. Additionally, 88% discontinued antibiotics once symptoms improved. While most interns selected antimicrobials based on academic knowledge, 36% reported prescribing antibiotics over the phone. Overall, the study highlights adequate knowledge but variable attitudes and suboptimal practices related to AMR among medical interns. Strengthening AMR-focused education and stewardship training is essential to promote rational antimicrobial use.

Keywords: Antimicrobial resistance, medical interns, antibiotic stewardship

1. Introduction

Antimicrobial resistance (AMR) has become one of the most pressing global public health challenges, undermining the effective prevention and treatment of infectious diseases. In India, the problem is particularly severe, with resistance extending beyond older antimicrobial agents to include critically important drugs such as carbapenems, which are often considered last-line therapies (Prestinaci *et al.*, 2015) ^[1]. The rapid emergence of resistance compromises clinical outcomes, increases healthcare costs, and poses a serious threat to population health.

Although AMR has traditionally been studied in human medicine, increasing evidence indicates that livestock and food-producing animals play a significant role in the emergence and dissemination of resistant bacteria. In India, the burden of AMR in food animals remains poorly documented, with most data originating from small, localized studies that cannot be generalized at the national level. The limited regulatory control over the non-therapeutic use of antibiotics in animals, particularly for growth promotion and disease prevention, is likely contributing to an unrecognized and substantial AMR

burden (Taneja *et al.*, 2019) [2].

The dairy sector provides early and compelling evidence of antimicrobial resistance in food animals. Mastitis, one of the most common diseases affecting dairy cattle and buffaloes, has been associated with the presence of diverse bacterial pathogens exhibiting resistance to commonly used antibiotics. Milk from mastitis animals may harbour multidrug-resistant organisms, sometimes occurring as co-infections, thereby posing risks to both animal health and food safety (Pascu *et al.*, 2022) [3]. Similar concerns have been raised in the poultry sector, where accurate estimates of antibiotic usage are lacking. Antibiotics are frequently administered through premixed feeds, often without clear labelling, making it difficult to quantify consumption levels. Studies have consistently reported high levels of antimicrobial resistance among bacteria isolated from poultry, animals, and seafood (Manyi-Loh *et al.*, 2018) [4].

In contrast, the aquaculture sector in India is subject to comparatively stricter regulatory oversight. The Food Safety and Standards Authority of India has banned the use of several antibiotics and pharmacologically active substances in fisheries, leading to greater scrutiny of AMR in this sector (Walia *et al.*, 2019) [5]. Legislative provisions aimed at restricting inappropriate antibiotic use are expected to influence resistance trends in aquaculture, although continued surveillance is required to assess their long-term impact (Andrew *et al.*, 2020) [6].

India is one of the largest consumers of antibiotics for human health, with substantial use also reported in food-producing animals. Although per capita antibiotic consumption is lower than in some high-income countries, the absolute volume is considerable. Notably, antimicrobial consumption in the food-animal sector is projected to increase significantly by 2030, raising concerns about accelerated resistance development if appropriate stewardship measures are not implemented (Ibrahim *et al.*, 2020) [7].

The Global Action Plan on AMR emphasizes improving awareness and understanding through education, communication, and training across human and animal health sectors. In India, AMR surveillance has largely focused on disease-specific vertical programs, while an integrated, cross-sectoral surveillance system remains limited (Walia *et al.*, 2019) [8]. Medical interns, as future prescribers, play a critical role in antimicrobial stewardship. Their knowledge, attitudes, and practices directly influence rational antibiotic use. Therefore, the present study was undertaken to assess the knowledge, attitude, and practices related to antimicrobial resistance among medical interns.

2. Materials and Methods

The present cross-sectional study was conducted in Puducherry with the objective of assessing the knowledge, attitude, and practices related to antimicrobial resistance among medical interns, with particular emphasis on their future antimicrobial prescribing behaviour.

2.1 Selection of respondents

A total of 200 medical interns were included in the study. The respondents were randomly selected from two government medical colleges in Puducherry, namely the Jawaharlal Institute of Postgraduate Medical Education and

Research (JIPMER) and the Indira Gandhi Medical College and Research Institute (IGMC & RI). From each institution, 100 medical interns were enrolled to ensure equal representation.

2.2 Questionnaire design and data collection

A structured, self-administered questionnaire comprising 30 questions was developed to assess the respondents' knowledge, attitude, and practices related to AMR. The questionnaire consisted of three sections, with 10 questions each focusing on knowledge, attitude, and practices.

Data were collected using Google Forms, and participation was voluntary. Prior to the main survey, the questionnaire was pre-tested among 25 medical interns who were not included in the final sample. Based on the feedback and experience gained during the pre-testing phase, necessary modifications were incorporated to improve clarity and relevance. The finalized questionnaire was then used for data collection.

2.2.1 Knowledge questions (True/False)

1. Superbug is a strain of bacteria that has become resistant to antibiotic drugs.
2. Do you know about Antimicrobial Stewardship Programme.
3. Antibiotics can kill viruses.
4. Name one antimicrobial banned for Human/Animal use in India.
5. Antibiotics have no side effects.
6. Narrow-spectrum antibiotics are preferred over broad-spectrum antibiotics when possible as it is less likely to cause resistance.
7. Drug of choice for MRSA infection.
8. Taking antibiotics at a lower dose than prescribed will help prevent resistance developing.
9. Antimicrobial treatment should be stopped once the symptoms are improved.
10. World Antibiotic Awareness Week is celebrated every year on the second week of September.

2.2.2 Attitude questions (Agree/Disagree/Neutral)

1. India will face an AMR apocalypse in the future.
2. Drug legislation in India is on par with legislation in the rest of the world.
3. Antimicrobial prescriptions should be based on culture and sensitivity report.
4. Skipping one or two doses does not contribute to the development of antimicrobial resistance.
5. It is essential to involve students in the research of antimicrobial resistance.
6. Broad-spectrum antimicrobials are ideal to be used as first-line antimicrobials.
7. Banning the use of prophylactic antimicrobials in food-producing animals will reduce the surge of antimicrobial resistance.
8. I am confident that new classes of antimicrobials will be available in the near future to solve current resistance problems.
9. Manufacturers of antimicrobials need to improve the treatment of their wastewater to reduce the release of residues into the environment.
10. Whose contribution do you feel is essential to combat

AMR? (Medicos/Vets/Both)

2.2.3 Practice-related questions (Yes/No)

2.2.3.1 Personal use

1. Have you taken any antibiotic in the past one yr? If yes, how many times? (<5 or >5)
2. Have you taken antibiotic without consulting a doctor?
3. Have you taken antibiotic after consulting a doctor over phone?
4. Do you stop the antibiotic course once your symptoms have improved?
5. Do you check the expiry date before using the antimicrobials?

2.2.3.2 Professional use

6. Your selection of antimicrobials for a patient (Human/Animal) is based on (Academic knowledge/Availability in pharmacy) If others mention,
7. The misuse of antimicrobials was evident in the facilities where you have trained.
8. Do you prescribe antimicrobials to your patients over phone?
9. How many days do you prescribe an antimicrobial for a condition? (3-5 days/depends on the condition)
10. Whether you enquire about the previous antibiotic taken by the patient before prescribing a new antibiotic for a condition?

3. Results and Discussion

AMR is a rapidly escalating global public health challenge driven largely by inappropriate antimicrobial use. Medical interns, as future prescribers, play a pivotal role in determining antimicrobial use patterns. The findings of the present study are discussed collectively to provide a holistic understanding of existing gaps and strengths.

3.1 Knowledge Regarding Antimicrobial Resistance

The assessment of knowledge revealed a moderate to good overall understanding of certain fundamental concepts related to AMR, alongside notable deficiencies in critical areas. A majority of the interns (76%) correctly identified the concept of superbugs as antibiotic-resistant bacterial strains. This level of awareness is encouraging, as early recognition of resistant infections is essential for timely diagnosis and appropriate therapeutic decision-making, particularly in hospital settings where multidrug-resistant organisms are prevalent.

However, awareness regarding antimicrobial stewardship programmes (ASPs) was alarmingly low, with only 28% of interns reporting familiarity. ASPs are central to optimizing antimicrobial use, reducing resistance, and improving patient outcomes. The lack of awareness among interns highlights a major educational gap, especially considering their integral role in clinical decision-making during internships. This finding underscores the need for structured stewardship training within undergraduate and internship curricula.

Encouragingly, 92% of respondents were aware that antibiotics are ineffective against viral infections, reflecting successful dissemination of basic antibiotic principles. Similarly, a high proportion (96%) acknowledged that antibiotics can cause adverse effects, suggesting reasonable

pharmacological awareness. Knowledge regarding the preference for narrow-spectrum antibiotics over broad-spectrum agents was present in 68% of interns, indicating partial understanding of resistance-minimizing strategies.

In contrast, knowledge about banned antimicrobials in India was strikingly poor, with 76% unable to name even one prohibited drug. Awareness of national drug regulations is essential to prevent misuse and illegal prescribing, particularly in a country where over-the-counter antibiotic availability remains a concern. This finding highlights the need for regular updates on regulatory policies during medical training.

Knowledge related to MRSA management was relatively high, with 88% correctly identifying appropriate drugs of choice, reflecting adequate clinical exposure. However, misconceptions persisted regarding treatment duration, as 96% believed antimicrobial therapy should be stopped once symptoms improve. Premature discontinuation of antibiotics is a well-recognized contributor to treatment failure and resistance development, indicating a critical misunderstanding that requires urgent correction.

Awareness of World Antibiotic Awareness Week was limited (64%), reflecting missed opportunities for global and national AMR advocacy initiatives to penetrate medical training environments. Overall, while foundational knowledge was satisfactory, deficiencies in stewardship, regulations, and treatment principles indicate the need for reinforced educational interventions.

3.2 Attitude Towards Antimicrobial Resistance

The attitude assessment revealed a generally positive and concerned outlook towards AMR among interns, though variability existed across domains. Nearly two-thirds (64%) believed that India is likely to face an AMR crisis in the future, reflecting recognition of the seriousness of the issue. India's high infectious disease burden, widespread antibiotic use, and regulatory challenges likely influence this perception.

Only 4% felt that Indian drug legislation is on par with global standards, while nearly half disagreed, indicating skepticism about regulatory effectiveness. This perception aligns with existing challenges in antibiotic enforcement and highlights the need for stronger policy awareness and implementation.

A substantial majority (72%) supported culture and sensitivity-based prescribing, demonstrating a favourable attitude toward evidence-based antimicrobial use. Likewise, 60% agreed that skipping doses contributes to resistance, reinforcing awareness of adherence-related risks. These findings suggest that while theoretical understanding exists, translation into consistent practice may be lacking.

An overwhelming 92% emphasized the importance of student involvement in AMR research, highlighting enthusiasm for academic engagement and interdisciplinary learning. This presents a valuable opportunity for institutions to integrate research-based learning modules focused on AMR.

Attitudes toward broad-spectrum antibiotic use were mixed, with only 32% disagreeing with their routine first-line use. This ambiguity suggests incomplete understanding of ecological consequences and microbiome disruption. Similarly, attitudes toward restricting prophylactic

antimicrobial use in food-producing animals were divided, with only 36% supporting bans. This reflects limited awareness of the One Health dimensions of AMR.

Optimism regarding the development of new antimicrobials was observed in 68% of interns, though such confidence may underestimate the complexities of drug discovery pipelines. Importantly, 68% acknowledged the role of pharmaceutical wastewater in environmental AMR spread, indicating growing awareness of environmental contributors.

The One Health perspective was strongly supported, with 88% agreeing that collaboration between medical and veterinary professionals is essential. This positive attitude provides a strong foundation for interdisciplinary AMR mitigation strategies.

3.3 Practices Related to Antimicrobial Use

Despite reasonable knowledge and generally positive attitudes, suboptimal practices related to antimicrobial use were evident. While 92% reported using antibiotics fewer than five times in the previous year, a concerning 60% admitted to consuming antibiotics without consulting a doctor. Self-medication is a major driver of resistance and reflects gaps in both regulatory enforcement and personal accountability.

Additionally, 44% reported antibiotic use following telephonic consultation. While telemedicine has a role in healthcare delivery, inappropriate antibiotic prescribing without adequate clinical evaluation can exacerbate misuse. Notably, 88% reported discontinuing antibiotics once symptoms improved, reinforcing earlier findings of poor adherence practices.

Positive practices included checking expiry dates (92%) and selecting antimicrobials based on academic knowledge (96%). However, 52% observed antimicrobial misuse in their training facilities, indicating systemic issues within healthcare settings that may normalize inappropriate prescribing behaviours.

Prescribing antibiotics over the phone to friends or relatives was reported by 36% of interns, highlighting ethical and professional lapses that can contribute to resistance. On a positive note, 84% enquired about previous antibiotic use before prescribing, reflecting awareness of resistance risks and patient history relevance.

The duration of antibiotic prescription varied according to disease severity in 76% of cases, suggesting individualized decision-making aligned with clinical judgment. Overall, while several responsible practices were observed, widespread inappropriate behaviours underscore the gap between knowledge and real-world application.

4. Conclusion

Overall, the study reveals a positive outlook toward antimicrobial resistance among medical interns, with most demonstrating sound basic knowledge, appropriate attitudes, and several responsible prescribing practices. High awareness of antibiotic side effects, resistance, MRSA management, and the importance of culture-based therapy reflects a strong academic foundation. The interns' recognition of AMR as a major future threat, support for interdisciplinary collaboration, and willingness to engage in AMR research further highlight their readiness to contribute

to containment efforts. Although certain gaps in stewardship awareness and prescribing practices were identified, these should be viewed as opportunities for focused training rather than shortcomings. Given their receptive attitude and foundational competence, medical interns represent a highly promising group in whom structured antimicrobial stewardship education during internship can effectively promote rational antibiotic use and strengthen efforts to combat antimicrobial resistance.

References

1. Prestinaci F, Pezzotti P, Pantosti A. Antimicrobial resistance: a global multifaceted phenomenon. *Pathog Glob Health*. 2015;109(7):309-18.
2. Taneja N, Sharma M. Antimicrobial resistance in the environment: the Indian scenario. *Indian J Med Res*. 2019 Feb;149(2):119-28.
3. Pascu C, Herman V, Iancu I, Costinar L. Etiology of mastitis and antimicrobial resistance in dairy cattle farms in the western part of Romania. *Antibiotics (Basel)*. 2022 Jan 3;11(1):57.
4. Manyi-Loh C, Mamphweli S, Meyer E, Okoh A. Antibiotic use in agriculture and its consequential resistance in environmental sources: potential public health implications. *Molecules*. 2018 Mar 30;23(4):795.
5. Walia K, Madhumathi J, Veeraraghavan B, Chakrabarti A, Kapil A, Ray P, *et al*. Establishing antimicrobial resistance surveillance & research network in India: journey so far. *Indian J Med Res*. 2019 Feb;149(2):164-79.
6. Selaledi LA, Hassan ZM, Manyelo TG, Mabelebele M. The current status of the alternative use to antibiotics in poultry production: an African perspective. *Antibiotics (Basel)*. 2020 Sep 11;9(9):594.
7. Ibrahim M, Ahmad F, Yaqub B, Ramzan A, Imran A, Afzaal M, *et al*. Current trends of antimicrobials used in food animals and aquaculture. In: *Antibiotics and Antimicrobial Resistance Genes in the Environment*. 2020. p. 39-69.
8. Walia K, Sharma M, Vijay S, Shome BR. Understanding policy dilemmas around antibiotic use in food animals & offering potential solutions. *Indian J Med Res*. 2019 Feb;149(2):107-18.