Research Article

Confidence in Antibiotic Prescribing Intentions among MBBS Students in a Tertiary Medical College in Etawah District: A Cross-Sectional Study

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A B S T R A C T

Background: Antimicrobial resistance (AMR) is a critical global health challenge. Medical students, as future prescribers, play a pivotal role in antibiotic stewardship. This study assesses confidence in antibiotic prescribing among MBBS students in a tertiary medical college in Etawah, Uttar Pradesh.

Methods: A cross-sectional study was conducted among 342 second-year to internship MBBS students using a self-administered questionnaire covering demographics, knowledge, attitudes, and prescribing confidence. Logistic regression identified predictors of confidence.

Results: Females comprised 58% of participants. Confidence in antibiotic prescribing increased across academic years, from 58% in second-year students to 75% among interns. Important factors that predicted confidence included being female, having good clinical knowledge, having more than three years of clinical training, and thinking that antimicrobial education is "useful."Attitude scores were negatively associated with confidence (OR=0.94, p=0.035).

Conclusion: Confidence in antibiotic prescribing improves with academic progression and clinical exposure. Structured AMR education, early clinical training, and targeted interventions addressing gender-specific variations can enhance confidence levels. These findings highlight the need for curriculum enhancements to prepare future doctors for effective antibiotic stewardship.

Keywords: Antimicrobial Resistance, Antibiotic Prescribing, Medical Education, Confidence, MBBS Students

Introduction

Antimicrobial resistance (AMR) represents one of the most significant global health challenges of the 21st century, threatening the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses, and fungi. The World Health Organisation has declared AMR as one of the top ten global public health threats facing humanity, with estimates suggesting that AMR-related deaths could reach 10 million annually by 2050.[1]

Medical students, as future healthcare providers, play a crucial role in addressing this challenge. Their confidence and competence in antibiotic prescribing during their formative years can significantly influence their future prescribing behaviors.[2] Studies indicate that up to 30-50% of antibiotic prescriptions in clinical practice may be inappropriate or unnecessary, highlighting the critical importance of developing strong prescribing confidence during medical training.[3]

In India, where the burden of infectious diseases remains high and antibiotic consumption has increased by 103% between 2000 and 2023,[4] understanding the confidence levels of medical students in antibiotic prescribing becomes particularly relevant. The situation in Uttar Pradesh, especially in semi-urban areas like Etawah District, presents unique challenges due to its diverse healthcare needs, varying levels of healthcare access, and the prevalence of self-medication practices among the population.[5]

The Uttar Pradesh Rural Institute of Medical Sciences and Research in Etawah, established in 2019, serves as a crucial training ground for future medical practitioners in the region. With an annual intake of approximately 100 MBBS students, it plays a vital role in shaping the healthcare workforce for both urban and rural areas.[6] The antibiotic prescribing practices of these future doctors will have far-reaching implications for the region's healthcare outcomes, particularly given that Etawah District serves a population of over 1.7 million people.[7]

Most previous research has assessed knowledge rather than confidence, leaving a gap in understanding how prepared medical students feel for antibiotic prescribing.[8] This gap is particularly pronounced in non-metropolitan areas, where graduates often begin their careers with minimal supervision and must make independent prescribing decisions early in their practice.[9]

This study aims to assess the confidence levels in antibiotic prescribing among MBBS students at a tertiary medical college in Etawah District, Uttar Pradesh. By understanding these confidence levels and identifying potential gaps,

educational interventions can be better targeted to prepare future physicians for responsible antibiotic stewardship. The findings will be particularly relevant for medical educators developing curriculum interventions and for policymakers working to strengthen antimicrobial stewardship programmes in similar settings.

The tertiary medical college in Etawah district, situated in a semi-urban region of Uttar Pradesh, provides a unique setting to study AMR education among MBBS students. This institution serves a diverse population, offering opportunities to examine the intersection of medical education, rural healthcare challenges, and AMR. By assessing students' knowledge, attitudes, and prescribing confidence, this study aims to inform curriculum improvements and enhance AMR-related training in similar settings.

Methods

This cross-sectional study was conducted between July and August 2023 at a tertiary medical college in Etawah, Uttar Pradesh. A convenience sample of 342 MBBS students from the second year to the internship year participated in the study. First-year students were excluded due to their limited clinical exposure.

A self-administered questionnaire, adapted from previous studies, was used for data collection. The questionnaire comprised five sections:

1. **Demographics:** Age, gender, and year of study.
2. **Knowledge:** 30 questions on AMR mechanisms, antibiotic use, and contributing factors, including clinical vignettes.
3. **Attitudes:** 15 Likert-scale questions assessing perceptions of AMR and antibiotic prescribing.
4. **Sources of Information:** Assessment of AMR-related training and awareness of guidelines.
5. **Confidence in Prescribing:** A single-item measure of self-rated confidence in future antibiotic prescribing.

Statistical Analysis

Data were analysed using SPSS version 25.0. Descriptive statistics were calculated for demographic variables and survey responses. Knowledge and attitude scores were expressed as percentages of correct or positive responses. Logistic regression analysis was performed to identify predictors of confidence in prescribing antibiotics.

Results

The study sample comprised of 58% females and 42% males, highlighting a higher proportion of female participants. Regarding the academic year distribution, 30% of the participants were final-year students, followed by 25% each from the third year and second year, and 20% were interns.

In figure 1, final year students scored highest in AMR Mechanisms (82), while interns led in Statistics (37). Overall, scores dropped for all groups in Guidelines and Clinical Vignettes, with the lowest being second-year students in Guidelines (22).

In figure 2, the pie chart shows that the majority of respondents (44%) felt only somewhat confident, while 30% reported not feeling confident. A smaller portion felt confident (22%) or very confident (4%).
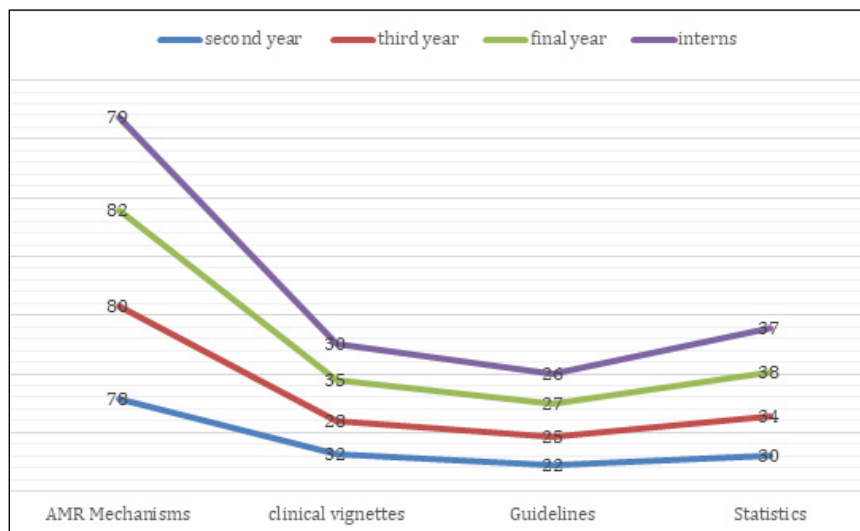

Figure 1. Batch-Wise Percentage Scores for Domain-Specific Knowledge in AMR

Table 1. Summary of Participants' Views and Engagement Toward AMR

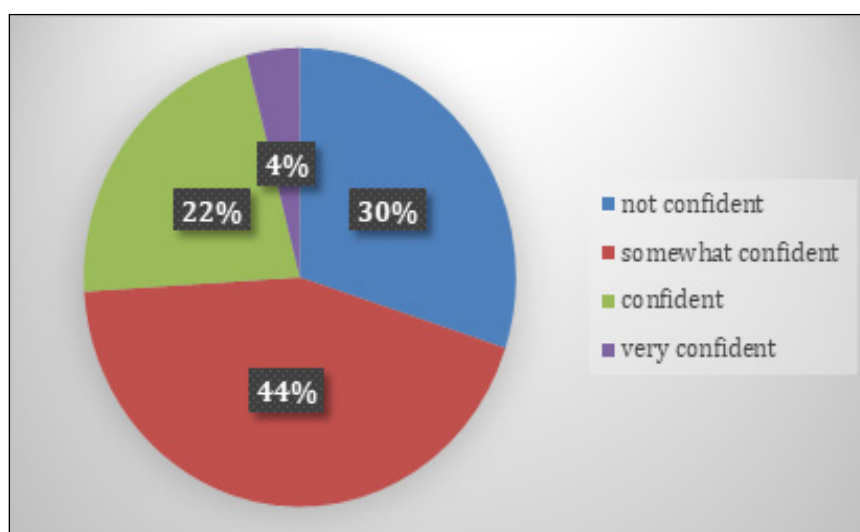| Batch	Motivation to Address AMR	Demanded More AMR Training	Willingness to Learn	Confidence in Advocacy	Recognized AMR as Critical issue
Second year	70	62	65	58	67
Third year	72	65	68	65	69
Final year	74	68	72	74	72
Internship	75	67	78	75	78

Figure 2. Proportions of Students Feeling Confident in Prescribing Antibiotics

Table 2.Independent predictors of confidence in future antibiotic prescribing intentions

Variables	p-value	Odds ratio	Confidence interval
Gender	< 0.001*	2.51	(1.51, 4.18)
Clinical knowledge	0.014†	1.26	(1.05, 1.51)
Attitude score	0.035	0.94	(0.88, 0.995)
Clinical training > 3 years on antibiotic prescribing	† 0.006*	2.48	(1.29, 4.75)
Familiar with the term "infection control"	0.071	0.601	(0.35, 1.05)
Ranking of antimicrobial education as "useful" or "very useful"	< 0.001*	2.72	(1.63, 4.56)
Awareness of Infection Control Program	0.023†	1.87	(1.09, 3.22)

Discussion

The present study provides significant insights into antibiotic prescribing confidence and antimicrobial resistance (AMR) awareness among medical students, revealing important patterns across academic years and identifying key predictors of prescribing confidence. The study population demonstrated a notable gender distribution, with females comprising 58% of participants compared to 42% males, reflecting the changing demographics in medical education. The academic distribution, with 30% final-year students, 25% each from third and second years, and 20% interns, provided a comprehensive cross-sectional view of AMR awareness and prescribing confidence development throughout medical training.

Our analysis revealed a consistent upward trend in domain-specific knowledge and attitudes toward AMR across academic years. Second-year students demonstrated baseline levels of motivation to address AMR (70%), which progressively increased through the third year (72%), final year (74%), and reached its peak during the internship (75%). This pattern was mirrored in other domains, with particularly notable improvements in willingness to learn (from 65% in the second year to 78% in theinternship) and confidence in advocacy (from 58% in the second year to 75% in the internship). The recognition of AMR as a critical issue also showed steady improvement, rising from 67% among second-year students to 78% among interns.

The multivariate analysis identified several significant independent predictors of confidence in future antibiotic prescribing. Gender emerged as a strong predictor (OR=2.51, CI=1.51-4.18, p<0.001), suggesting the need for targeted educational interventions to address potential gender-based variations in confidence levels. This could be due to differences in clinical exposure, cultural factors or self-perception in medical competence. Clinical knowledge (OR=1.26, CI=1.05-1.51, p=0.014) and extended clinical training exceeding three years (OR=2.48, CI=1.29-4.75, p=0.006) were also significant positive predictors, emphasising the crucial role of practical experience in developing prescribing confidence.

Educational factors played a substantial role in developing prescribing confidence. Students who ranked antimicrobial education as "useful" or "very useful" showed significantly higher confidence levels (OR=2.72, CI=1.63-4.56, p<0.001). Similarly, awareness of the Infection Control Program positively influenced confidence (OR=1.87, CI=1.09-3.22, p=0.023). Interestingly, the attitude score showed a slight negative correlation with confidence (OR=0.94, CI=0.88-0.995, p=0.035), suggesting that increased awareness of AMR complexity might lead to more cautious prescribing behaviors.

These findings have important implications for medical education. The consistent demand for more AMR training across all years, coupled with the strong impact of clinical training duration, suggests the need for enhanced AMR-specific curriculum content and early clinical exposure. The significant correlation between perceived usefulness of antimicrobial education and confidence indicates the importance of engaging, practical training approaches. Moreover, the gender-specific variations in confidence levels highlight the need for targeted support strategies.

However, several limitations should be considered when interpreting these results. The cross-sectional nature of the study limits our ability to assess temporal changes in confidence development. Additionally, self-reported confidence measures may not perfectly reflect actual clinical competence. Future research should focus on longitudinal studies tracking confidence development through medical training, investigation of the relationship between confidence and actual prescribing practices, and evaluation of targeted educational interventions based on the identified predictors.

Based on these findings, we recommend enhancing clinical training opportunities in antibiotic prescribing, developing structured AMR awareness programmes from early years, integrating infection control awareness into the core curriculum, and implementing regular assessment of confidence levels and knowledge gaps. Special attention should be paid to developing gender-sensitive teaching approaches to address the identified confidence disparities

Conclusion

Our study highlights the complex interplay between academic progression, clinical exposure, and confidence in antibiotic prescribing among medical students. While the findings demonstrate positive trends in AMR awareness and confidence development through medical training, they also identify specific areas for educational intervention and improvement. The significant predictors identified provide valuable guidance for developing targeted educational strategies to enhance antibiotic prescribing confidence among future medical practitioners.

Conflict of Interest: None

Source of Funding: None

Author's Contribution: All authors contributed to the study's conception, design, data collection, analysis, and manuscript preparation and approved the final version for submission.

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