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Original Research Article

KNOWLEDGE, ATTITUDE AND PRACTICE REGARDING ANTIBIOTIC USE AND ANTIMICROBIAL RESISTANCE AMONG UNDERGRADUATE MEDICAL STUDENTS

V. Thiruloga Chandran[1], M, Thangaraj[2], T. Gnanakumar[3], J. Suriakumar[4], T. Murugalakshmi[5]

[1]*Associate Professor, Department of General Surgery, Government Medical College, Dindigul, Tamil Nadu, India.*
[2]*Associate Professor, Department of Medicine, Government Medical College, Dindigul, Tamil Nadu, India.*
[3]*Associate Professor, Department of General Surgery, Government Medical College, Ramanathapuram, Tamil Nadu, India.*
[4]*Associate Professor, Department of Microbiology, Government Medical College, Dindigul, Tamil Nadu, India*
[5]*Assistant Professor, Department of Pharmacology, Government Medical College, Dindigul, Tamil Nadu, India.*

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Corresponding Author:
Dr. J. Suriakumar,
Associate Professor, Department of Microbiology, Government Medical College, Dindigul, Tamil Nadu, India.
Email: suryjay@gmail.com

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ABSTRACT

Background: Antimicrobial resistance (AMR) is a major global public health concern driven by inappropriate antibiotic use. Healthcare students play a critical role in future antimicrobial stewardship; therefore, assessing their knowledge, attitude, and practice (KAP) regarding AMR is essential. The objective is to evaluate the knowledge, attitude, and practice related to antimicrobial resistance among undergraduate medical students.

Materials and Methods: A cross-sectional, questionnaire-based study was conducted among 50 undergraduate medical students aged ≥18 years. A structured 20-item self-administered questionnaire assessed knowledge, attitude, and practice using a 4-point Likert scale. Scores were categorized as good (≥75%), moderate (50–74%), or poor (<50%). Data were analyzed using descriptive statistics, chi-square test for associations, and Pearson correlation to determine relationships between KAP domains.

Results: The mean knowledge, attitude, and practice scores were 21.6 ± 3.2, 22.4 ± 3.5, and 17.8 ± 3.1, respectively. Good knowledge was observed in 68% of participants, while 72% demonstrated a positive attitude toward AMR control. However, only 56% showed good antibiotic-related practices. No significant association was found between gender and knowledge level (χ^2 = 1.84, p = 0.39). A moderate positive correlation was observed between knowledge and attitude (r = 0.48, p = 0.001) and between knowledge and practice (r = 0.41, p = 0.003).

Conclusion: Although undergraduate students demonstrated good knowledge and positive attitudes toward AMR, gaps in appropriate practices persist. Strengthening educational interventions and integrating antimicrobial stewardship training into undergraduate curricula may help bridge this knowledge–practice gap.

Keywords: Antimicrobial resistance; Self-medication; Non-prescription antibiotics; Cross-sectional survey; Antibiotic misuse; Public health.

INTRODUCTION

Antibiotics represent one of the most transformative discoveries in modern medicine, drastically reducing morbidity and mortality associated with infectious diseases.[1,2] However, the effectiveness of these life-saving drugs is increasingly threatened by the rapid emergence and global spread of antimicrobial resistance (AMR). Recent global estimates indicate that bacterial AMR was directly responsible for approximately 1.27 million deaths in 2019, with nearly 5 million deaths associated with resistant infections worldwide.[3] These alarming trends underscore the urgent need to address inappropriate antibiotic use across all healthcare settings. One of the major drivers of AMR is the irrational and unsupervised use of antibiotics, particularly the practice of self-medication without a valid medical

prescription. Non-prescription antibiotic use refers to the acquisition and consumption of antibiotics without consultation with a licensed healthcare provider. This practice is widespread in many low- and middle-income countries (LMICs), where antibiotics are frequently available over the counter despite regulatory restrictions.[4,5] Self-medication with antibiotics is associated with several risks, including incorrect drug selection, inappropriate dosing, inadequate duration of therapy, and use for viral infections such as the common cold or influenza. These practices contribute significantly to the selection pressure that drives the emergence of resistant pathogens.[6] Studies conducted across diverse populations have consistently demonstrated a high prevalence of antibiotic self-medication, ranging to over 70% depending on geographical and socio-economic contexts.[7] During the COVID-19 pandemic, antibiotic misuse further escalated due to fear, misinformation, and limited access to healthcare facilities.[8,9] In addition to regulatory and structural factors, public knowledge, attitudes, and beliefs play a critical role in shaping antibiotic consumption behaviour. Misconceptions regarding the effectiveness of antibiotics for viral infections remain prevalent in many communities.[10] The Organisation for Economic Co-operation and Development has emphasized that improving public awareness about appropriate antibiotic use is essential to reducing unnecessary consumption and slowing resistance trends. Knowledge gaps, previous positive experiences with antibiotics, perceived cost savings, and long waiting times at healthcare facilities are commonly reported reasons for self-medication.[11,12] Weak enforcement of pharmaceutical regulations and inadequate antimicrobial stewardship programs contribute to this challenge. The World Health Organization Global Action Plan on AMR highlights the need for strengthened governance, surveillance, and stewardship interventions to promote rational antibiotic use.[13] India, along with other South Asian countries, bears a substantial burden of AMR. High population density, widespread infectious diseases, and easy availability of antibiotics create conditions conducive to misuse.[14,15] Understanding the prevalence, behavioural patterns, and determinants of non-prescription antibiotic use is critical for designing targeted public health interventions. Cross-sectional survey studies provide valuable insights into population-level knowledge, attitudes, and practices (KAP) related to antibiotic use. Such data can inform antimicrobial stewardship strategies, guide educational campaigns, and support evidence-based policymaking. Furthermore, identifying demographic and socio-economic factors associated with self-medication enables tailored interventions aimed at high-risk groups. Given the growing global threat of AMR and the substantial contribution of irrational antibiotic use to resistance development, there is a pressing need to assess community-level practices and associated knowledge gaps. The present study aims to evaluate the prevalence, patterns, and determinants of non-prescription antibiotic use through a structured questionnaire-based cross-sectional survey. By examining behavioural drivers and awareness levels, this study seeks to contribute evidence that can support strengthened regulatory enforcement, public health education, and antimicrobial stewardship initiatives.

MATERIALS AND METHODS

Study Design and Setting: A cross-sectional, questionnaire-based study was conducted among undergraduate students to assess their knowledge, attitude, and practice (KAP) regarding antimicrobial resistance (AMR). The study utilized a structured, self-administered anonymous questionnaire.

Study Participants: A total of 50 undergraduate medical students participated in the study. Participants were recruited using convenience sampling. Only students aged ≥18 years were included. Participation was voluntary and anonymous.

Ethical Approval Statement: Formal ethical committee approval was not required for this study as it involved an anonymous, minimal-risk questionnaire survey among adult undergraduate students. No personal identifiers, sensitive information, or clinical interventions were involved. Participation was voluntary, and submission of the completed questionnaire implied informed consent. The study adhered to standard ethical principles for social and behavioural research, including confidentiality, voluntary participation, and data protection.

Study Instrument: Data were collected using a structured questionnaire comprising 20 items divided into three domains:

- Knowledge
- Attitude
- Practice

All items were measured using a 4-point Likert scale:

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

Negative statements were reverse coded during analysis.

The possible score ranges were:

- Knowledge: 7–28
- Attitude: 7–28
- Practice: 6–24
- Total KAP score: 20–80

Higher scores indicated better knowledge, positive attitudes, and appropriate practices toward AMR.

Data Collection Procedure: The questionnaire was distributed in printed format. No personal identifiers were collected. Submission of the completed questionnaire implied consent to participate.

Statistical Analysis: Data were entered into Microsoft Excel and analysed descriptively. Reverse

coding was applied where appropriate. Continuous variables were summarized using mean and standard deviation (SD). Categorical variables were expressed as frequencies and percentages.

KAP levels were categorized as:

- Good: ≥75% of maximum score
- Moderate: 50–74%
- Poor: <50%

RESULTS

Demographic Characteristics: A total of 50 undergraduate students participated in the study. The majority belonged to the 21–23 years age group (44%), followed by 18–20 years (36%). Female participants constituted 42% of the sample, while 48% were male and 10% preferred not to disclose gender. Participants were fairly distributed across all years of study [Figure 1].

Knowledge Domain: The mean knowledge score was 21.6 ± 3.2 (possible range: 7–28), indicating generally good awareness regarding antimicrobial resistance. Overall, 68% of participants demonstrated good knowledge, while only 4% had poor knowledge [Table 1].

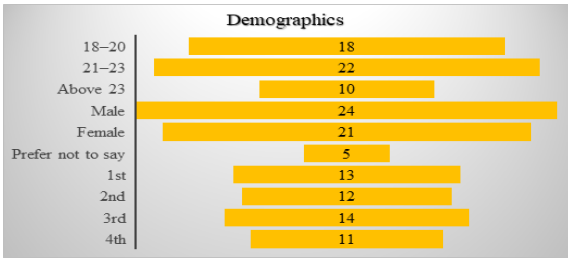

Figure 1: Demographic Characteristics of Participants (n = 50)

A chi-square test was performed to assess association between gender and knowledge level. No statistically significant association was observed ($\chi^2 = 1.84$, $p = 0.39$), suggesting knowledge levels were comparable across genders.

Table 1: Knowledge Level Distribution (n = 50)

Category	Frequency (n)	Percentage (%)
Good	34	68.0
Moderate	14	28.0
Poor	2	4.0
Total	50	100

Attitude Domain: The mean attitude score was 22.4 ± 3.5 (range: 7–28). A majority (72%) demonstrated a positive attitude toward antimicrobial stewardship and control measures. Only 4% showed a poor attitude [Table 2].

Correlation analysis showed a moderate positive correlation between knowledge and attitude scores ($r = 0.48$, $p = 0.001$), indicating that higher knowledge was associated with more positive attitudes toward AMR prevention.

Table 2: Attitude Level Distribution (n = 50)

Category	Frequency (n)	Percentage (%)
Good	36	72.0
Moderate	12	24.0
Poor	2	4.0
Total	50	100

Practice Domain: The mean practice score was 17.8 ± 3.1 (range: 6–24). Although 56% demonstrated good practices, 36% showed moderate practices and 8% had poor practices. Compared to knowledge and attitude domains, practice scores were relatively lower [Table 3].

Pearson correlation analysis revealed a statistically significant positive correlation between knowledge and practice scores ($r = 0.41$, $p = 0.003$), suggesting that improved knowledge was associated with better antibiotic-related practices.

Table 3: Practice Level Distribution (n = 50)

Category	Frequency (n)	Percentage (%)
Good	28	56.0
Moderate	18	36.0
Poor	4	8.0
Total	50	100

Overall KAP Score: The overall mean KAP score was 61.8 ± 7.4 (maximum score: 80). Overall, 64% of participants demonstrated good KAP, while 30% had moderate levels and only 6% had poor overall KAP [Figure 2].

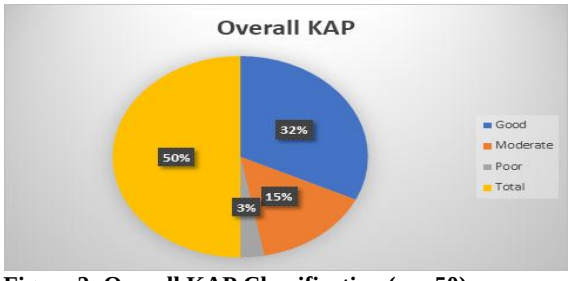

Figure 2: Overall KAP Classification (n = 50)

DISCUSSION

The present study assessed knowledge, attitude, and practice (KAP) regarding antimicrobial resistance (AMR) among undergraduate students. The findings indicate generally good knowledge and positive attitudes; however, appropriate practices were comparatively lower, highlighting a persistent knowledge–practice gap.

In the current study, 68% of participants demonstrated good knowledge regarding AMR. This finding aligns with recent research conducted among undergraduate students in India by Varshney et al. (2024), which reported satisfactory awareness of AMR causes and consequences among medical students.[16] Similarly, Sharma et al. (2025), in a study among undergraduates in Nepal reported moderate to high knowledge levels regarding antibiotic resistance.[17] These consistent findings may reflect increasing integration of AMR topics into health education curricula and broader public health campaigns.

Attitude toward AMR was positive in 72% of participants in the present study. A moderate positive correlation between knowledge and attitude ($r = 0.48$, $p = 0.001$) suggests that improved understanding of AMR is associated with stronger stewardship-oriented perceptions. Comparable findings were reported by Murthy et al. (2025) where higher academic exposure was associated with improved attitudes toward rational antibiotic use.[18] This supports the premise that educational reinforcement can positively influence perceptions regarding antimicrobial stewardship. Despite encouraging knowledge and attitudes, practice scores were comparatively lower, with only 56% demonstrating good antibiotic-related practices. This discrepancy reflects the widely documented knowledge–behaviour gap in AMR research. Bawazir et al. (2025), in a study observed that although students were aware of AMR risks, inappropriate practices such as self-medication and incomplete antibiotic courses persisted.[19] Such findings underscore that knowledge alone may be insufficient to drive behavioural change. The significant positive correlation between knowledge and practice ($r = 0.41$, $p = 0.003$) observed in the present study suggests that enhanced awareness may contribute to improved antibiotic use behaviors. However, the absence of significant differences across gender and academic year indicates that AMR awareness may be uniformly distributed rather than progressively improving with academic advancement. This finding contrasts with Murthy et al. (2025), who reported improved KAP scores among senior medical students, possibly due to structured pharmacology exposure.[18] Overall, 64% of participants demonstrated good KAP scores. While this is encouraging, the lower practice levels highlight the need for targeted behavioural interventions. Educational strategies should extend beyond theoretical instruction to include case-based learning, antimicrobial stewardship simulations, and policy awareness sessions to effectively bridge the knowledge–practice gap.

CONCLUSION

In conclusion, undergraduate students demonstrated good knowledge and positive attitudes toward antimicrobial resistance; however, appropriate antibiotic-related practices were comparatively lower. The findings highlight the importance of integrating structured AMR education and behavioral interventions within undergraduate curricula to bridge the knowledge–practice gap and support global antimicrobial stewardship efforts.

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