ISSN (O) 3108-2246 https://doi.org/10.66328/ijprmh.2026.020104

International Journal of Public Research in Medicine and Health (IJPRMH)

Volume 2, Issue 1, Jan-Mar 2026

Original Research Article

Assessment of Knowledge, Attitude, and Practice (KAP) Regarding Antimicrobial Stewardship Among Resident Doctors in a Tertiary Care Teaching Hospital

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Abstract

Background:
Antimicrobial resistance (AMR) represents a major global health challenge, driven largely by inappropriate antimicrobial use. Antimicrobial stewardship programs (ASPs) aim to optimize antibiotic prescribing; however, their effectiveness depends significantly on the knowledge, attitude, and practices (KAP) of frontline prescribers, particularly resident doctors.

Methods:
A cross-sectional, questionnaire-based study was conducted at a tertiary care teaching institution in North India over six months. A structured, validated Google Forms proforma was used to assess KAP related to antimicrobial stewardship among resident doctors. A total of 1500 residents participated. Data were analyzed using descriptive and inferential statistics, with $p < 0.05$ considered statistically significant.

Results:
Among participants, 48% demonstrated good knowledge, while 78% exhibited a positive attitude toward antimicrobial stewardship. Awareness of AMR was high (92%), but familiarity with WHO AWaRe classification was limited (44%). Appropriate prescribing practices were observed in only 44% of residents. Senior residents had significantly better knowledge compared to junior residents ($p < 0.001$). A notable gap between knowledge and practice was identified.

Conclusion:
Despite adequate awareness and favorable attitudes, substantial deficiencies in stewardship-related knowledge and prescribing practices persist among resident doctors. Structured training programs and strengthened institutional stewardship measures are essential to improve rational antimicrobial use and bridge the knowledge–practice gap.

Keywords: Antimicrobial Stewardship, Antimicrobial Resistance, Prescribing Practices, Resident Doctors, KAP Study

Introduction

Antimicrobial resistance (AMR) has emerged as one of the most pressing global health challenges of the 21st century, threatening the effective prevention and treatment of a wide range of infectious diseases. The rapid proliferation of resistant pathogens is largely driven by inappropriate and excessive use of antimicrobial agents in clinical practice, resulting in increased morbidity, mortality, and healthcare expenditure [1]. The burden of AMR is particularly substantial in low- and middle-income countries, where regulatory oversight, diagnostic capacity, and antimicrobial stewardship infrastructure remain variable [2].

Antimicrobial stewardship programs (ASPs) have been advocated as a cornerstone strategy to optimize antimicrobial use, improve clinical outcomes, and curb the emergence of resistance. These programs emphasize evidence-based prescribing, appropriate selection, dosing, route, and duration of therapy, as well as timely de-escalation based on microbiological data [3]. International bodies, including the World Health Organization (WHO), have reinforced stewardship efforts through frameworks such as the Access, Watch, and Reserve (AWaRe) classification to guide rational antibiotic use and policy implementation [4]. Resident doctors represent a critical cohort within hospital settings, as they are frequently responsible for initiating and modifying antimicrobial therapy. Their prescribing behaviour is influenced by multiple factors, including clinical knowledge, perceived patient expectations, institutional culture, and accessibility to guidelines [5]. Deficiencies in knowledge, suboptimal attitudes toward stewardship principles, and inconsistent prescribing practices have been documented among trainees, potentially undermining the effectiveness of ASPs [6]. Furthermore, the gap between knowledge and actual prescribing behaviour highlights the need for systematic evaluation of these domains.

Assessment of knowledge, attitude, and practice (KAP) related to antimicrobial stewardship provides a pragmatic approach to identify educational gaps and behavioural determinants among prescribers. Such evaluations are instrumental in designing targeted interventions, including structured training programs, guideline dissemination, and audit-feedback mechanisms, thereby strengthening institutional stewardship efforts [7]. Therefore, the present study aims to assess the knowledge, attitude, and practices regarding antimicrobial stewardship among resident doctors in a tertiary care teaching hospital.

Methodology

Study Design and Setting

This cross-sectional, questionnaire-based study was conducted at Government Medical College (GMC), Amritsar, a tertiary care teaching institution in North India, over a period of six months following approval from the Institutional Ethics Committee. The study was designed to assess the knowledge, attitude, and practices related to antimicrobial stewardship among resident doctors. Participation was voluntary, and the study adhered to established ethical principles for research involving human participants.

Study Population and Sampling

The study population comprised resident doctors from various clinical departments, including both junior and senior residents who were actively engaged in patient care and antimicrobial prescribing. Residents from non-clinical and para-clinical disciplines, as well as interns, were excluded to ensure that responses reflected practical prescribing responsibilities. Only participants who provided informed consent and completed the questionnaire were included in the final analysis.

A universal sampling approach was employed. The questionnaire was disseminated electronically through a

structured Google Forms proforma, which was circulated via official institutional communication channels, including email groups and messaging platforms. A total of 1500 resident doctors participated in the study and constituted the final sample.

Study Instrument

Data were collected using a structured, self-administered questionnaire developed after an extensive review of the literature on antimicrobial stewardship and previously validated knowledge, attitude, and practice (KAP) tools. The questionnaire was adapted to the local clinical context while maintaining consistency with established antimicrobial stewardship principles. Content validity was ensured through expert evaluation by faculty from the departments of pharmacology, microbiology, and clinical medicine.

Pilot Testing and Validation

Prior to full-scale administration, the questionnaire was pilot-tested on a subset of resident doctors to evaluate clarity, relevance, and feasibility. Feedback obtained during the pilot phase was used to refine the wording and structure of the instrument. The final version of the questionnaire was considered suitable for assessing the intended domains.

Data Collection Procedure

The finalized questionnaire was administered electronically using Google Forms. The survey link was shared through institutional communication platforms, and participants were allowed to respond at their convenience. Electronic informed consent was obtained at the beginning of the form. Measures were implemented to restrict duplicate responses and ensure data integrity. All responses were collected anonymously to maintain confidentiality.

Study Variables and Scoring

The questionnaire was divided into four domains. The first domain included demographic and professional characteristics such as age, gender, specialty, year of residency, and prior exposure to antimicrobial stewardship training. The second domain assessed knowledge related to antimicrobial resistance, rational antibiotic use, hospital antibiotic policies, and awareness of frameworks such as the WHO AWaRe classification. The third domain evaluated attitudes toward antimicrobial stewardship, including perceptions of antimicrobial resistance and acceptance of guideline-based prescribing. The fourth domain assessed self-reported prescribing practices, including use of microbiological investigations, antibiotic selection, de-escalation strategies, and duration of therapy.

Knowledge scores were calculated by assigning one point to each correct response. Attitude and practice domains were assessed using five-point Likert scale responses, and composite scores were derived. Based on predefined cut-off values, participants were categorized into levels reflecting adequacy of knowledge, positivity of attitude, and appropriateness of practices.

Statistical Analysis

Data collected through Google Forms were exported into Microsoft Excel and subsequently analysed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Descriptive statistics were used to summarize demographic characteristics and KAP scores, expressed as means with standard deviations for continuous variables and frequencies with percentages for categorical variables.

Inferential statistical analysis was performed to determine associations between KAP scores and demographic variables such as specialty and level of training. The chi-square test was used for categorical variables, while independent t-test and one-way analysis of variance (ANOVA) were applied for comparison of mean scores across groups. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of GMC Amritsar prior to commencement of the study. Participation was voluntary, and electronic informed consent was obtained from all participants. Data confidentiality and anonymity were strictly maintained throughout the study.

Bias and Limitations

Efforts were made to minimize bias by ensuring anonymity, voluntary participation, and restriction of duplicate responses. However, as the study relied on self-reported data, the possibility of reporting bias and social desirability bias cannot be entirely excluded. Despite this limitation, the large sample size and inclusion of participants from multiple clinical specialties enhance the representativeness and robustness of the findings.

Results

A total of 1500 resident doctors participated in the study, representing a diverse cohort across clinical specialties. The distribution of demographic and professional characteristics is summarized in **Table 1.** The majority of participants were in the age group of 26–30 years (56.0%), followed by those aged ≤25 years (21.3%) and >30 years (22.7%). Male participants constituted 60.7% of the study population. Junior residents formed a larger proportion (65.3%) compared to senior residents (34.7%). With respect to specialty distribution, residents from medicine and allied branches accounted for the highest proportion (41.3%), followed by surgery and allied specialties (36.0%), while those from emergency and intensive care units comprised 14.0%. Notably, only 28.0% of participants reported prior formal training in antimicrobial stewardship, indicating a substantial gap in structured educational exposure.

Table 1: Demographic and Professional Characteristics of Participants (n = 1500)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	≤ 25	320	21.3
	26–30	840	56.0
	> 30	340	22.7
Gender	Male	910	60.7
	Female	590	39.3
Level of Training	Junior Resident	980	65.3
	Senior Resident	520	34.7
Specialty	Medicine & allied	620	41.3
	Surgery & allied	540	36.0
	Emergency/ICU	210	14.0
	Others	130	8.7
Prior ASP Training	Yes	420	28.0
	No	1080	72.0

The assessment of knowledge regarding antimicrobial stewardship is presented in **Table 2**. Awareness of antimicrobial resistance as a global health concern was high, with 92.0% of respondents answering correctly. Similarly, a considerable proportion demonstrated understanding of empirical versus targeted therapy (76.0%). However, awareness of institutional antibiotic policies was relatively limited (54.0%), and less than half of the

participants were familiar with the WHO AWaRe classification (44.0%). Knowledge regarding de-escalation therapy was observed in 60.0% of respondents. When overall knowledge scores were categorized, 48.0% of residents demonstrated good knowledge, whereas 36.0% and 16.0% fell into moderate and poor knowledge categories, respectively. These findings indicate that while baseline awareness exists, critical gaps remain in specific stewardship components.

Table 2: Knowledge of Antimicrobial Stewardship Among Residents

Knowledge Variable	Correct Response (n)	Percentage (%)
Awareness of antimicrobial resistance (AMR) as a global issue	1380	92.0
Knowledge of empirical vs targeted therapy	1140	76.0
Awareness of hospital antibiotic policy	810	54.0
Familiarity with WHO AWaRe classification	660	44.0
Knowledge of de-escalation therapy	900	60.0
Overall Knowledge Score		
Good	720	48.0
Moderate	540	36.0
Poor	240	16.0

Attitudes toward antimicrobial stewardship were generally favourable, as depicted in **Table 3**. A vast majority of participants (95.0%) acknowledged antimicrobial resistance as a serious global health issue, and 90.0% agreed that stewardship programs contribute to improved patient outcomes. Approximately 80.0% supported strict adherence to prescribing guidelines, while 84.0% recognized the importance of microbiological support in guiding antibiotic therapy. Furthermore, 88.0% expressed the need for regular antimicrobial stewardship training programs. Overall, 78.0% of participants demonstrated a positive attitude, whereas a smaller proportion exhibited neutral (16.0%) or negative (6.0%) attitudes. This suggests a strong conceptual acceptance of stewardship principles among resident doctors.

Table 3: Attitude Towards Antimicrobial Stewardship

Attitude Statement	Agree/Strongly Agree (n)	Percentage (%)
AMR is a serious global health problem	1425	95.0
Antimicrobial stewardship improves patient outcomes	1350	90.0
Guidelines should be followed strictly	1200	80.0
Microbiology support is essential for antibiotic decisions	1260	84.0
Need for regular ASP training programs	1320	88.0
Overall Attitude		
Positive	1170	78.0
Neutral	240	16.0
Negative	90	6.0

In contrast to knowledge and attitude, self-reported practices related to antimicrobial use were comparatively suboptimal **(Table 4).** Only 58.0% of participants reported routine use of antibiotic guidelines in clinical practice. Culture and sensitivity testing prior to initiation of antibiotics was practiced by 52.0% of respondents, while 48.0% reported implementing de-escalation based on microbiological findings. Avoidance of antibiotic use in viral infections was reported by 64.0% of residents, indicating partial adherence to rational prescribing principles. Appropriate duration of antibiotic therapy was followed by 55.0% of participants. Overall, only 44.0% of residents demonstrated appropriate prescribing practices, whereas 56.0% fell into the inappropriate practice category, highlighting a significant gap between knowledge and actual clinical behaviour.

Table 4: Self-Reported Practices Related to Antimicrobial Use

Practice Variable	Appropriate Practice (n)	Percentage (%)
Routine use of antibiotic guidelines	870	58.0
Ordering culture sensitivity tests before antibiotics	780	52.0
De-escalation based on culture reports	720	48.0
Avoidance of antibiotics in viral infections	960	64.0
Appropriate duration of antibiotic therapy	825	55.0
Overall Practice		
Appropriate	660	44.0
Inappropriate	840	56.0

The association between knowledge levels and level of training is illustrated in **Table 5**. A significantly higher proportion of senior residents demonstrated good knowledge (59.6%) compared to junior residents (41.8%). Conversely, moderate to poor knowledge was more prevalent among junior residents (58.2%) than senior residents (40.4%). This difference was found to be statistically significant ($p < 0.001$), indicating that clinical experience and progression in training are associated with improved understanding of antimicrobial stewardship principles.

Table 5: Association of Knowledge with Level of Training

Level of Training	Good Knowledge (n, %)	Moderate/Poor (n, %)	p-value
Junior Residents (n = 980)	410 (41.8%)	570 (58.2%)	
Senior Residents (n = 520)	310 (59.6%)	210 (40.4%)	<0.001*
*Statistically significant			

Discussion

The present study provides a comprehensive evaluation of knowledge, attitude, and practices (KAP) related to antimicrobial stewardship among resident doctors in a large tertiary care teaching institution. The findings reveal a pattern commonly observed in stewardship research—while awareness and attitudes toward antimicrobial resistance (AMR) are largely favourable, significant gaps persist in domain-specific knowledge and, more

importantly, in translation into clinical practice.

A high proportion of participants recognized AMR as a serious global health concern (92%), which is consistent with earlier studies demonstrating widespread awareness among healthcare professionals [5,6]. This heightened awareness likely reflects increasing global and national emphasis on AMR as a public health priority. However, awareness alone does not necessarily translate into appropriate prescribing behaviour. In the present study, only 48% of participants demonstrated good overall knowledge, with notable deficiencies in familiarity with institutional antibiotic policies and the WHO AWaRe classification. These findings are aligned with previous reports indicating inadequate understanding of stewardship frameworks among trainees, particularly in low- and middle-income settings [6,7].

The relatively low awareness of AWaRe classification (44%) is of particular concern, given its growing importance as a practical tool for guiding rational antibiotic use and surveillance [4]. Similar observations have been reported in recent studies, where lack of familiarity with AWaRe categories was identified as a barrier to effective stewardship implementation [8]. This underscores the need to integrate such frameworks more explicitly into undergraduate and postgraduate medical curricula, as well as into institutional prescribing protocols.

Attitudinal assessment in the present study demonstrated a predominantly positive orientation toward antimicrobial stewardship, with 78% of participants expressing favorable attitudes. A majority acknowledged the importance of stewardship programs, adherence to guidelines, and the role of microbiological support. These findings are consistent with prior studies indicating that healthcare providers generally exhibit a receptive attitude toward stewardship initiatives [5,9]. The high proportion of residents advocating for regular training programs further highlights an intrinsic motivation to improve prescribing practices, which can be leveraged for designing targeted educational interventions.

Despite this encouraging attitudinal profile, the study revealed suboptimal practices across multiple domains. Less than 60% of participants reported routine use of antibiotic guidelines, and fewer than half practiced de-escalation based on microbiological results. Similarly, only 52% reported consistent use of culture sensitivity testing prior to antibiotic initiation. These findings indicate a substantial gap between knowledge and practice, a phenomenon widely documented in antimicrobial stewardship literature [7,10]. Factors contributing to this discrepancy may include time constraints, diagnostic uncertainty, limited access to microbiological services, and entrenched prescribing habits within institutional settings.

The observation that only 44% of participants demonstrated appropriate prescribing practices is particularly noteworthy. Comparable studies have reported similar trends, wherein appropriate antimicrobial use remains suboptimal despite adequate awareness [10,11]. This suggests that behavioral and systemic factors play a critical role in influencing prescribing decisions, beyond individual knowledge alone. Addressing these barriers requires a multifaceted approach, including strengthening institutional stewardship programs, ensuring timely availability of diagnostic support, and implementing audit and feedback mechanisms.

An important finding of the present study is the statistically significant association

between level of training and knowledge scores. Senior residents demonstrated significantly better knowledge compared to their junior counterparts ($p < 0.001$), indicating that clinical experience contributes to improved understanding of antimicrobial stewardship principles. Similar trends have been reported in previous studies, where senior trainees exhibited more rational prescribing behavior and greater adherence to guidelines [5,12]. However, the persistence of suboptimal practices even among senior residents suggests that experiential learning alone may not be sufficient, and structured training remains essential.

The low proportion of participants with prior antimicrobial stewardship training (28%) further reinforces this need. Formal training programs have been shown to significantly improve both knowledge and prescribing behavior, emphasizing their critical role in capacity building [9,13]. Incorporation of regular, competency-based stewardship training sessions, particularly during early residency, may help bridge the observed knowledge–practice gap.

The strengths of the present study include its large sample size and inclusion of residents across multiple clinical specialties, enhancing the representativeness of the findings. The use of a structured and validated questionnaire further adds to the methodological rigor. However, certain limitations must be acknowledged. The reliance on self-reported practices introduces the possibility of reporting bias, and the cross-sectional design precludes assessment of causal relationships. Additionally, being a single-center study, the findings may not be fully generalizable to other settings.

Conclusion

This study demonstrates that although resident doctors exhibit strong awareness and favorable attitudes toward antimicrobial stewardship, critical gaps persist in applied knowledge and prescribing practices. The findings underscore the need for structured, competency-based training and strengthened institutional stewardship frameworks to bridge the knowledge–practice divide. A key strength of the study is its large, multidisciplinary sample, enhancing the robustness of observations. However, reliance on self-reported data and the single-center design may limit generalizability. Targeted educational interventions and system-level reinforcement are essential to translate stewardship principles into consistent clinical practice.

References

1. O'Neill J. Tackling drug-resistant infections globally: final report and recommendations. London: Review on Antimicrobial Resistance; 2016.
2. Laxminarayan R, Duse A, Wattal C, Zaidi AKM, Wertheim HFL, Sumpradit N, et al. Antibiotic resistance—the need for global solutions. Lancet. 2013;382(9893):1057–1098.
3. Barlam TF, Cosgrove SE, Abbo LM, MacDougall C, Schuetz AN, Septimus EJ, et al. Implementing an antibiotic stewardship program: guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. Clin Infect Dis. 2016;62(10):e51–e77.
4. World Health Organization. AWaRe classification of antibiotics for evaluation and monitoring of use. Geneva: WHO; 2019.
5. Pulcini C, Williams F, Molinari N, Davey P, Nathwani D. Junior doctors' knowledge and perceptions

of antibiotic resistance and prescribing: a survey in France and Scotland. Clin Microbiol Infect. 2011;17(1):80–87.

6. Dyar OJ, Nathwani D, Monnet DL, Gyssens IC, Stålsby Lundborg C, Pulcini C. Do medical students feel prepared to prescribe antibiotics responsibly? Results from a cross-sectional survey in 29 European countries. J Antimicrob Chemother. 2018;73(8):2236–2242.
7. Abbo LM, Cosgrove SE, Pottinger PS, Pereyra M, Sinkowitz-Cochran R, Srinivasan A, et al. Medical students' perceptions and knowledge about antimicrobial stewardship: how are we educating our future prescribers? Clin Infect Dis. 2013;57(5):631–638.
8. Hsia Y, Sharland M, Jackson C, Wong ICK, Magrini N, Bielicki JA. Consumption of oral antibiotic formulations for young children according to the WHO Access, Watch, Reserve (AWaRe) classification. Lancet Infect Dis. 2019;19(1):67–75.
9. Castro-Sánchez E, Drumright LN, Gharbi M, Farrell S, Holmes AH. Mapping antimicrobial stewardship in undergraduate medical, dental, pharmacy, nursing and veterinary education in the United Kingdom. PLoS One. 2016;11(2):e0150056.
10. Charani E, Castro-Sánchez E, Sevdalis N, Kyratsis Y, Drumright L, Shah N, et al. Understanding the determinants of antimicrobial prescribing within hospitals: the role of "prescribing etiquette". Clin Infect Dis. 2013;57(2):188–196.
11. Gharbi M, Moore LS, Castro-Sánchez E, Spanoudaki E, Grady C, Holmes AH, et al. A needs assessment study for optimising prescribing practice in secondary care junior doctors: the antibiotic prescribing education among doctors (APED). BMC Infect Dis. 2016;16:456.
12. Dyar OJ, Hills H, Seitz LT, Perry A, Ashiru-Oredope D. Assessing the knowledge, attitudes and behaviors of human and animal health students towards antibiotic use and resistance: a pilot cross-sectional study in the UK. Antibiotics (Basel). 2018;7(1):10.
13. Abbo LM, Cosgrove SE, Pottinger PS, Pereyra M, Sinkowitz-Cochran R, Srinivasan A, et al. Medical students' perceptions and knowledge about antimicrobial stewardship: how are we educating our future prescribers? Clin Infect Dis. 2013;57(5):631–638.

Cite this Article: Manzoor A, Salmani MF, Dubburu K. Assessment of Knowledge, Attitude, and Practice (KAP) Regarding Antimicrobial Stewardship Among Resident Doctors in a Tertiary Care Teaching Hospital. International Journal of Public Research in Medicine and Health. Jan-Mar 2026 (2)1: 26-33. https://doi.org/10.66328/ijprmh.2026.020104