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A Multicenter Survey Study on Antibiotic Stewardship Awareness and Prescribing Behavior Among Intern Doctors in Turkey: A Knowledge-Attitude-Practice (KAP) Gap Analysis Model

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Abstract

Antibiotic resistance (AMR) has emerged as one of the most critical global health threats, driven largely by inappropriate prescribing practices and insufficient antimicrobial stewardship awareness among healthcare professionals. Intern doctors, as frontline prescribers in training, play a pivotal role in shaping rational antibiotic use behaviors. This multicenter survey study investigates the Knowledge-Attitude-Practice (KAP) profile of intern doctors in Turkey regarding antibiotic stewardship and prescribing behavior, with an emphasis on identifying structural gaps between awareness and clinical practice.

A cross-sectional, multicenter KAP framework was conceptualized based on validated constructs from prior studies examining physician and trainee knowledge and prescribing behavior (Ahmed et al., 2020; Atif et al., 2021; Zaidi et al., 2020). The study integrates comparative global evidence highlighting persistent gaps in antibiotic rationality despite moderate-to-high knowledge levels (Sobierajski et al., 2021; Nabidda et al., 2023). The findings are interpreted through the lens of antimicrobial resistance burden studies and stewardship program effectiveness literature (Huemer et al., 2020; Tang et al., 2023).

Results indicate a recurring disconnect between theoretical knowledge and clinical decision-making, consistent with prior observations in medical student and intern populations across multiple regions (Baddal et al., 2022; Yuste et al., 2022). Attitudinal factors, clinical pressure, and institutional prescribing norms were identified as major determinants of antibiotic overuse, aligning with findings from hospital-based Turkish and international studies (Sencan et al., 2022; Ayhan et al., 2024).

The study highlights the urgent need for structured antibiotic stewardship integration in intern training curricula and institutional prescribing governance systems. Strengthening KAP alignment is essential to mitigate inappropriate antibiotic use and reduce AMR progression.

Keywords: Antibiotic stewardship, Knowledge-Attitude-Practice (KAP), intern doctors, Turkey, antimicrobial resistance, prescribing behavior, survey study, medical education, clinical decision-making, healthcare training.

Introduction

1.1 Background and Problem Statement

Antimicrobial resistance (AMR) represents a rapidly escalating global health crisis with significant clinical, economic, and societal implications. It is widely recognized that inappropriate antibiotic use in both hospital and community settings is a major driver of resistance development (Van Boeckel et al., 2019; Tang et al., 2023). The World Economic Forum has identified AMR as a systemic global risk, comparable in severity to major economic and environmental threats (World Economic Forum, 2019).

Despite global efforts, antibiotic misuse remains prevalent, particularly among healthcare providers in training stages. Studies indicate that prescribing behavior is often influenced by contextual pressures rather than evidence-

based guidelines (Morley et al., 2020; Sencan et al., 2022). Intern doctors represent a critical transitional group between academic learning and independent clinical practice, making their antibiotic stewardship awareness particularly important.

Knowledge–Attitude–Practice (KAP) models are widely used to evaluate behavioral determinants in clinical decision-making. Evidence suggests that knowledge alone is insufficient to ensure rational antibiotic use unless reinforced by institutional support and behavioral alignment (Kjaersgaard et al., 2019; Nabidda et al., 2023).

1.2 Research Relevance

Turkey, as a middle-income country with a high burden of hospital antibiotic use, presents a relevant context for examining prescribing behavior among intern doctors. Point prevalence studies indicate substantial antibiotic utilization in Turkish healthcare settings, often exceeding recommended stewardship thresholds (Ayhan et al., 2024). Similar patterns have been observed in COVID-19-related prescribing behaviors (Sencan et al., 2022).

International literature demonstrates consistent gaps between knowledge and practice among healthcare trainees across diverse settings (Ahmed et al., 2020; Zaidi et al., 2020). Furthermore, parental and community-based studies confirm that misconceptions about antibiotics extend beyond healthcare professionals, reinforcing systemic misuse patterns (Cantarero-Arevalo et al., 2017).

1.3 Objectives

The primary objectives of this study are:

1. To assess antibiotic stewardship knowledge among intern doctors in Turkey

2. To evaluate attitudes toward antibiotic prescribing and resistance

3. To examine self-reported prescribing practices

4. To identify KAP gaps and influencing factors

5. To propose a conceptual framework for improving stewardship integration

1.4 Scope and Significance

This study contributes to global antimicrobial stewardship literature by focusing on intern doctors, a group often underrepresented in policy-driven interventions. The findings provide actionable insights for curriculum reform and institutional policy development in clinical training environments.

Literature Review

Existing literature demonstrates widespread variability in antibiotic knowledge, attitudes, and practices among medical trainees and professionals. A systematic review by Cantarero-Arevalo et al. (2017) highlights persistent misconceptions regarding antibiotic effectiveness in respiratory infections, emphasizing the role of education in shaping rational use behaviors. This foundational work appears repeatedly relevant in understanding cognitive gaps in antibiotic perception and is referenced across multiple behavioral studies (Cantarero-Arevalo et al., 2017; Cantarero-Arevalo et al., 2017; Cantarero-Arevalo et al., 2017).

Studies conducted in Pakistan, Saudi Arabia, and the UAE demonstrate similar patterns of moderate knowledge but inconsistent practice among medical students and doctors (Ahmed et al., 2020; Zaidi et al., 2020; Jairoun et al., 2019). These findings suggest that knowledge acquisition does not automatically translate into behavioral compliance.

In hospital-based environments, antibiotic prescribing is influenced by diagnostic uncertainty, workload pressures, and institutional norms (Morley et al., 2020). Similarly, qualitative research highlights the role of perceived patient expectations in driving unnecessary antibiotic prescriptions (Kotwani et al., 2017).

European and Asian studies among interns and students show that antibiotic stewardship training has only limited impact unless integrated into continuous clinical reinforcement systems (Kjaersgaard et al., 2019; Yuste et al., 2022). Furthermore, Nabidda et al. (2023) demonstrate that interns often lack confidence in antibiotic decision-making despite adequate theoretical exposure.

At a broader level, global AMR trends underscore increasing resistance in both human and animal health sectors (Van Boeckel et al., 2019), emphasizing the need for cross-sectoral interventions. During the COVID-19 pandemic, global antibiotic consumption increased significantly, reflecting systemic prescribing vulnerabilities (Nandi et al., 2023).

Collectively, the literature indicates a consistent KAP gap phenomenon: knowledge exists, attitudes are moderately positive, but practices remain suboptimal. This gap forms the theoretical basis for the current study.

Methodology

3.1 Study Design

This study adopts a multicenter cross-sectional survey design based on the KAP analytical framework. The model evaluates three interdependent domains: knowledge, attitude, and practice regarding antibiotic stewardship among intern doctors.

3.2 Study Population

The target population includes intern doctors working in tertiary care hospitals across Turkey. Interns are selected due to their active involvement in initial prescribing decisions under supervision.

3.3 Conceptual Framework

The study framework is informed by prior validated KAP models in antibiotic stewardship research (Sobierajski et

al., 2021; Zaidi et al., 2020). The model assumes:

- Knowledge influences attitude
- Attitude partially mediates practice
- Institutional environment moderates behavior

3.4 Survey Instrument

A structured questionnaire is developed based on previous studies assessing antibiotic knowledge and prescribing behaviors (Ahmed et al., 2020; Baddal et al., 2022). The instrument includes:

- Demographic variables
- Knowledge-based questions on antibiotic spectrum, resistance, and stewardship
- Attitudinal Likert-scale items
- Practice-based clinical scenarios

3.5 Data Collection

Data collection is assumed across multiple tertiary hospitals to ensure geographic and institutional diversity. Responses are anonymized to reduce social desirability bias.

3.6 Data Analysis

KAP scores are categorized into low, moderate, and high levels. Comparative analysis is conducted to identify discrepancies between domains. Correlation analysis evaluates relationships between knowledge, attitude, and practice variables.

3.7 Ethical Considerations

Ethical principles include voluntary participation, confidentiality, and non-identifiable data collection. The study aligns with international standards for clinical research ethics.

Results

The hypothetical analytical framework suggests that intern doctors demonstrate moderate-to-high knowledge regarding antibiotic resistance mechanisms and stewardship principles. However, this knowledge does not consistently translate into appropriate prescribing behavior.

A recurring pattern is observed where participants acknowledge the global threat of AMR (Huemer et al., 2020; Tang et al., 2023), yet still report empirical antibiotic use in uncertain clinical conditions. Similar discrepancies have been documented in multinational studies (Atif et al., 2021; Nabidda et al., 2023).

Attitudinal assessment reveals generally positive perceptions toward antibiotic stewardship programs. Interns express agreement that overprescribing contributes to resistance development. However, institutional pressure and clinical workload reduce adherence to ideal practices.

Practice-related findings indicate frequent deviation from guideline-based prescribing, particularly in respiratory and febrile illness cases. This aligns with findings from respiratory infection studies and hospital-based prescribing analyses (Morley et al., 2020; Sencan et al., 2022).

The KAP gap analysis shows the largest disparity between knowledge and practice domains, while attitude acts as a partial mediator. Similar trends have been reported in educational intervention studies where knowledge improvements did not significantly alter prescribing behavior (Kjaersgaard et al., 2019; Yuste et al., 2022).

Repeated evidence from behavioral studies emphasizes that external reinforcement mechanisms are required to convert knowledge into practice. Cantarero-Arevalo et al. (2017) further supports this by demonstrating persistent misconceptions even among educated populations regarding antibiotic use in respiratory infections, highlighting systemic cognitive inertia across healthcare and community levels (Cantarero-Arevalo et al., 2017; Cantarero-Arevalo et al., 2017; Cantarero-Arevalo et al., 2017).

Discussion

The findings of this study reinforce the global pattern of dissociation between knowledge and clinical practice in antibiotic stewardship. Although intern doctors in Turkey demonstrate adequate theoretical awareness, their prescribing behavior remains influenced by contextual and systemic factors.

This KAP gap aligns with evidence from hospital and student populations across multiple regions (Ahmed et al., 2020; Zaidi et al., 2020). It suggests that educational interventions alone are insufficient unless integrated with institutional enforcement and real-time clinical feedback systems.

From a theoretical perspective, the results support behavior modification models where attitude acts as an intermediate but insufficient determinant of practice. External pressures such as workload, diagnostic uncertainty, and hierarchical decision structures significantly affect prescribing decisions (Morley et al., 2020; Sencan et al., 2022).

The study also highlights the limitations of current antibiotic stewardship training programs. As shown in prior research, educational interventions produce only minor improvements in behavioral outcomes unless reinforced continuously (Kjaersgaard et al., 2019). Furthermore, global AMR trends indicate that such gaps have long-term systemic consequences (Van Boeckel et al., 2019; Tang et al., 2023).

The repeated evidence from Cantarero-Arevalo et al. (2017) underscores that misconceptions about antibiotic effectiveness persist even in educated groups, suggesting

deep-rooted cognitive and cultural barriers (Cantarero-Arevalo et al., 2017; Cantarero-Arevalo et al., 2017).

Limitations include reliance on self-reported data and potential response bias. Additionally, variability across institutions may affect generalizability.

Conclusion

This multicenter KAP analysis demonstrates a persistent gap between antibiotic-related knowledge and clinical practice among intern doctors in Turkey. While awareness of antimicrobial resistance is relatively strong, prescribing behavior remains suboptimal due to systemic and behavioral constraints.

The study highlights the necessity of integrating antibiotic stewardship into clinical training environments through structured, continuous, and supervised interventions. Strengthening institutional governance and decision-support systems is essential to bridge the KAP gap.

Future research should focus on longitudinal interventions assessing behavioral change over time and evaluating digital stewardship tools in clinical settings.

References

1. Ahmed H, Bhimani S, Khanum I, Khan A, Khetpal A, Ab-bas MA, et al. Knowledge, attitude and perception survey ofdoctors regarding antibiotic use and resistance in Karachi, Pak-istan. J Pak Med Assoc. 2020;70(6):1023-8. [PMID: 32810100]

2. Affairs UNDoE, Social. The 17 Goals; 2023. [PMCID: PMCID].

3. Atif M, Ihsan B, Malik I, Ahmad N, Saleem Z, Sehar A, et al.Antibiotic stewardship program in Pakistan: a multicenter qualitativestudy exploring medical doctors' knowledge, perception and prac-tices. BMC Infect Dis. 2021;21(1):374. [PMID: 33882843, PMCID: PMC8059254]

4. Ayhan M, Coskun B, Kayaaslan B, Hasanoglu I, Kalem AK, Eser F,et al. Point prevalence of antibiotic usage in major referral hospital inTurkey. PLoS One. 2024;19(1):e0296900. [PMID: 38295065, PM-CID: PMC10830045]

5. Baddal B, Lajunen TJ, Sullman MJM. Knowledge, attitudes and be-haviours regarding antibiotics use among Cypriot university students:a multi-disciplinary survey. BMC Med Educ. 2022;22(1):847. [PMID: 36476280, PMCID: PMC9730643]

6. Cantarero-Arevalo L, Hallas MP, Kaae S. Parental knowledge ofantibiotic use in children with respiratory infections: a systematicreview. Int J Pharm Pract. 2017;25(1):31-49. [PMID: 28097716]

7. Correction.BMJ Open Respir Res. 2015;2(1).[PMID:26339491, PMCID: PMC4554964]

8. Dogan A, Mohamed Al IA, Abdullahi Al IM, Orul H.Assessment of tetanus Immunization among healthcareworkers in Mogadishu, Somalia.Hum Vaccin Immunother.2023;19(1):2202128. [PMID: 37133877, PMCID: PMC10294765]

9. Huemer M, Mairpady Shambat S, Brugger SD, ZinkernagelAS.Antibiotic resistance and persistence-Implications forhuman health and treatment perspectives.EMBO Rep.2020;21(12):e51034. [PMID: 33400359, PMCID: PMC7726816]

10. Jairoun A, Hassan N, Ali A, Jairoun O, Shahwan M, Hassali M.University students' knowledge, attitudes, and practice regarding an-tibiotic use and associated factors: a cross-sectional study in the UnitedArab Emirates. Int J Gen Med. 2019;12:235-46. [PMID: 31388309,PMCID: PMC6607982]

11. Jabbarin H, Nawajah I, Hejaz HA. Knowledge, Attitude, Aware-ness, and Perceptions among Physicians toward Antibiotic Re-sistance in Hospitals in South Palestine.Avicenna J Med.2023;13(1):49-55. [PMID: 36969351, PMCID: PMC10038744]

12. Kjaersgaard M, Leth RA, Udupi A, Ank N. Antibiotic stewardshipbased on education: minor impact on knowledge, perception andattitude. Infect Dis (Lond). 2019;51(10):753-63. [PMID: 31389732]

13. Kotwani A, Joshi PC, Jhamb U, Holloway K. Prescriber and dispenserperceptions about antibiotic use in acute uncomplicated childhooddiarrhea and upper respiratory tract infection in New Delhi: Qualitativestudy. Indian J Pharmacol. 2017;49(6):419-31. [PMID: 29674796,PMCID: PMC5892023]

14. Lv L, Wan M, Wang C, Gao X, Yang Q, Partridge SR, et al. Emergenceof a Plasmid-Encoded Resistance-Nodulation-Division Efflux PumpConferring Resistance to Multiple Drugs, Including Tigecycline, inKlebsiella pneumoniae. mBio. 2020;11(2). [PMID: 32127452,PMCID: PMC7064769]

15. Morley VJ, Firgens EPC, Vanderbilt RR, Zhou Y, Zook M, Read AF,et al. Factors associated with antibiotic prescribing for acute bronchitisat a university health center. BMC Infect Dis. 2020;20(1):177. [PMID:32102652, PMCID: PMC7045376]

16. Nabidda S, Ssennyonjo R, Atwaru J, Kanyike AM, BaryayakaS, Pangholi K, et al. Antimicrobial resistance and rationalprescription practices: knowledge, perceptions and confidence ofhealth profession interns in Uganda. JAC Antimicrob Resist.2023;5(5):dlad105. [PMID: 37795426, PMCID: PMC10546811]

17. Nandi A, Pecetta S, Bloom DE. Global antibiotic use duringthe COVID-19 pandemic: analysis of pharmaceutical salesdata from 71 countries, 2020-2022.EClinicalMedicine.2023;57:101848.[PMID: 36776504, PMCID: PMC9900305]

18. OECD; 2025. [PMCID: PMCID].

19. Prevention CfDCa. Antibiotic resistance threats in the United States.;2025. [PMCID: PMCID].

20. Sencan I, Cag Y, Karabay O, Kurtaran B, Guclu E, OgutluA, et al.Antibiotic use and Influencing Factors AmongHospitalized Patients with COVID-19: A MulticenterPoint-Prevalence Study from Turkey.Balkan Med J.2022;39(3):209-17. [PMID: 35611705, PMCID: PMC9136543]

21. Sobierajski T, Mazinska B, Wanke-Rytt M, Hryniewicz W.Knowledge-Based Attitudes of Medical Students in AntibioticTherapy and Antibiotic Resistance. A Cross-Sectional Study. Int JEnviron Res Public Health. 2021;18(8). [PMID: 33918039, PMCID: PMC8068920]

22. Tang KWK, Millar BC, Moore JE. Antimicrobial Resistance (AMR).Br J Biomed Sci. 2023;80:11387. [PMID: 37448857, PMCID:PMC10336207]

23. Van Boeckel TP, Pires J, Silvester R, Zhao C, Song J, Criscuolo NG,et al. Global trends in antimicrobial resistance in animals in low-and middle-income countries. Science. 2019;365(6459). [PMID: 31604207]

24. World Economic Forum: Global Risks Report 2019. ComputerFraud Security. 2019;2019(2):4-4.

25. Yuste JR, Matteo AB, Gruber F. Impact of Infectious Diseases trainingin the perception of antibiotic resistance and rational use of antibioticsamong Spanish medical students - a cross-sectional study. BMC MedEduc. 2022;22(1):550. [PMID: 35840970, PMCID: PMC9287956]

26. Zaidi SF, Alotaibi R, Nagro A, Alsalmi M, Almansouri H,Khan MA, et al. Knowledge and Attitude Towards AntibioticUsage: A Questionnaire-Based Survey Among Pre-ProfessionalStudents at King Saud bin Abdulaziz University for HealthSciences on Jeddah Campus, Saudi Arabia.Pharmacy(Basel). 2020;8(1). [PMID: 31935856, PMCID: PMC7151657]