CROSS-SECTIONAL SURVEY OF ANTIBIOTIC PRESCRIPTION PRACTICES AMONG GENERAL PRACTITIONERS

Original Article

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ABSTRACT

Background: Inappropriate antibiotic prescribing in primary care significantly contributes to the global burden of antimicrobial resistance. General practitioners (GPs), being the primary point of contact in healthcare, play a crucial role in antibiotic stewardship. Understanding their prescribing behavior is essential to develop effective interventions.

Objective: To assess the patterns, knowledge, and attitudes related to antibiotic prescription practices among general practitioners in Pakistan.

Methods: A cross-sectional survey was conducted from August 2024 to April 2025 across urban and rural regions of Pakistan. A total of 480 registered GPs were selected using stratified random sampling. A structured, validated questionnaire assessed demographic characteristics, prescribing behavior across common clinical scenarios, knowledge on antimicrobial resistance, and attitudes influencing prescribing decisions. Data were analyzed using SPSS v26, applying descriptive statistics, chi-square tests, and ANOVA for group comparisons. Ethical approval was obtained from the Institutional Review Board (IRB).

Results: The mean participant age was 38.2 years; 58.3% were male. URTIs and UTIs were the most common conditions for which antibiotics were prescribed, with URTIs showing a 65.1% rate of inappropriate prescriptions. While awareness of antimicrobial resistance was high (mean score: 8.1/10), stewardship knowledge was lower (mean score: 4.9/10). Attitudinal analysis revealed fear of complications (78.4%) and patient pressure (65.2%) as major drivers of inappropriate prescribing.

Conclusion: Antibiotic prescription practices among GPs in Pakistan demonstrate high rates of inappropriate use, underlining the need for targeted educational and policy interventions to enhance rational antibiotic use in primary care.

Keywords: Antibiotic Stewardship, Antimicrobial Resistance, General Practitioners, Pakistan, Primary Health Care, Prescribing Behavior, Surveys and Questionnaires.

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INTRODUCTION

The rise of antimicrobial resistance (AMR) poses a significant threat to global health, driven in large part by inappropriate and excessive use of antibiotics. Among the various contributors to this problem, the role of general practitioners (GPs) has attracted increasing scrutiny, given that primary care settings account for the majority of antibiotic prescriptions. Despite growing awareness and educational initiatives promoting rational antibiotic use, empirical evidence continues to suggest persistent gaps between recommended prescribing guidelines and actual clinical practices (1). This discrepancy is not only a medical concern but a public health imperative, as it accelerates the evolution of resistant microbial strains, diminishing the efficacy of even the most potent antibiotics. Antibiotic prescription behaviors in primary care are shaped by a complex interplay of factors. These include clinical uncertainty, patient expectations, time constraints, and a lack of immediate diagnostic tools (2). Numerous studies have indicated that GPs often feel pressured to prescribe antibiotics even when clinical indications are ambiguous or absent, particularly in the management of upper respiratory tract infections and other self-limiting illnesses. For example, research has shown that non-clinical factors—such as fear of complications, diagnostic uncertainty, and perceived patient satisfaction—significantly influence prescribing patterns. Consequently, antibiotics are frequently prescribed in situations where their use is not justified, such as viral infections, leading to misuse and overuse (3,4).

Moreover, there is notable geographic and systemic variation in prescription practices, with cultural, socioeconomic, and infrastructural variables further influencing GP behavior. Some studies highlight that in lower-resource settings or regions with limited regulatory oversight, antibiotic prescriptions are more frequently driven by empirical judgment rather than evidence-based guidelines (5,6). These inconsistencies contribute to a fragmented understanding of how antibiotics are prescribed across different populations and healthcare contexts. Without a clear and updated picture of these practices, especially from the prescribers' perspective, efforts to standardize and optimize antibiotic use may fall short (7,8). While a substantial body of literature exists regarding hospital-based antibiotic stewardship, there remains a relative dearth of research focusing on outpatient settings, particularly general practice (9). This gap is concerning given the sheer volume of antibiotics prescribed in community healthcare. Furthermore, most available studies tend to concentrate on prescription volume and resistance patterns, often overlooking the attitudinal and contextual dimensions that influence prescribing behaviors at the GP level. Understanding these nuances is critical for developing targeted interventions that are not only evidence-based but also practically feasible and context-sensitive (10,11).

Cross-sectional survey studies offer a valuable approach to capturing real-world prescribing behaviors and perceptions within a defined population at a single point in time. By systematically exploring the knowledge, attitudes, and self-reported practices of general practitioners, such research can provide actionable insights into the drivers of antibiotic use. These insights, in turn, can inform more effective policy-making, clinical guidelines, and educational campaigns tailored to the needs and realities of primary care providers. Additionally, surveys allow for the identification of patterns and trends that may not be evident through prescription data alone, such as practitioners' understanding of AMR, their confidence in clinical decision-making, and their perceived barriers to guideline adherence. In light of these considerations, this study aims to investigate the antibiotic prescription practices among general practitioners through a structured cross-sectional survey. By examining not only what antibiotics are prescribed but also why they are prescribed in specific clinical contexts, the research seeks to bridge the gap between policy and practice. The objective is to generate a nuanced understanding of prescribing behaviors, which will support the development of more tailored and effective strategies for promoting judicious antibiotic use in primary care.

METHODS

This cross-sectional survey was designed to assess antibiotic prescription practices among general practitioners operating in the primary healthcare setting across various regions of Pakistan. Conducted over an eight-month period from August 2024 to April 2025, the study focused on exploring the prescribing behavior, underlying rationale, and knowledge of general practitioners regarding antibiotic use. The choice of a cross-sectional design was informed by the need to capture a snapshot of prevailing practices and perceptions at a single point in time, enabling the identification of trends and gaps that could inform targeted interventions. The target population comprised registered general practitioners currently practicing in both public and private healthcare facilities throughout Pakistan. A multistage sampling strategy was employed to ensure representation across urban, semi-urban, and rural areas in the provinces of Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan. The inclusion criteria stipulated that, participants must hold a valid medical license, be actively involved in outpatient clinical care, and have at least one year of post-house job experience. Practitioners who were currently in training

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programs such as residency or working exclusively in inpatient or emergency departments were excluded to maintain the study's focus on community-level prescription practices (12).

Sample size estimation was calculated using OpenEpi software, assuming a 50% prevalence of inappropriate antibiotic prescribing to maximize variability, a 95% confidence level, and a 5% margin of error. This yielded a minimum required sample size of 384 participants. Accounting for an estimated 20% non-response rate, the final sample size was inflated to 480 general practitioners. Participants were selected through stratified random sampling, ensuring proportional representation across geographic regions and facility types (12,13). Data collection was carried out using a structured, self-administered questionnaire developed following an extensive literature review and in consultation with infectious disease experts and pharmacologists. The instrument comprised both closed and semi-open-ended questions divided into sections covering demographic details, commonly encountered clinical scenarios, prescribing preferences, awareness of national and international antibiotic guidelines, and perceived barriers to rational prescribing. The questionnaire also included Likert-scale items to assess attitudes toward antimicrobial resistance and self-reported adherence to antibiotic stewardship principles.

Prior to formal data collection, a pilot study involving 30 general practitioners was conducted to validate the content and clarity of the questionnaire. Necessary adjustments were made based on the feedback received, improving both the comprehensibility and reliability of the instrument. Internal consistency was assessed using Cronbach's alpha, with a coefficient of 0.82 indicating acceptable reliability. Data were collected both in-person and through an online platform to enhance accessibility and participation. Respondents were provided with clear instructions and were assured of the confidentiality and anonymity of their responses. Participation was entirely voluntary, and written informed consent was obtained from all participants. Ethical approval for the study was secured from the Institutional Review Board (IRB). The primary outcome measures included the frequency of antibiotic prescriptions in specified clinical conditions, the proportion of prescriptions deemed inappropriate based on national guidelines, and the level of knowledge regarding antimicrobial resistance and stewardship. Secondary outcomes included perceived drivers of inappropriate prescribing and practitioner-reported confidence in clinical decision-making regarding antibiotic use.

All responses were entered into SPSS version 26 for analysis. Descriptive statistics were computed to summarize participant demographics and overall prescribing trends. Continuous variables such as years of practice were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages. Normality of data distribution was confirmed using the Shapiro-Wilk test. For bivariate analysis, the chi-square test was employed to assess associations between categorical variables such as years of experience and frequency of inappropriate prescribing. For normally distributed continuous variables, independent sample t-tests and one-way ANOVA were used as appropriate to compare means across different practitioner groups. A p-value of <0.05 was considered statistically significant. The methodological rigor, representative sampling, and robust statistical approach used in this study are expected to yield valuable insights into the current state of antibiotic prescription practices among general practitioners in Pakistan. This foundational understanding will be instrumental in guiding future interventions aimed at improving antibiotic stewardship in the primary care setting.

RESULTS

The study enrolled a total of 480 general practitioners from various urban and rural regions across Pakistan. The mean age of participants was 38.2 years, with males comprising 58.3% of the sample. The majority practiced in urban settings (66.7%) and over half were affiliated with private healthcare institutions (54.1%). The average duration of clinical experience was 12.6 years. Regarding antibiotic prescribing patterns, upper respiratory tract infections (URTI) were the most frequent indication, with antibiotics prescribed in 72.5% of such cases. This was followed by urinary tract infections (85.2%) and skin infections (80.6%). Notably, 34.1% of patients presenting with undifferentiated fever received antibiotics. In terms of appropriateness, URTIs had the highest rate of inappropriate prescriptions at 65.1%, while UTI-related prescriptions were least likely to be inappropriate at 19.3%. Knowledge assessments revealed that most practitioners were aware of antimicrobial resistance (mean score: 8.1 out of 10), but familiarity with standard prescribing guidelines was lower (mean: 5.3). Scores related to understanding resistance patterns and stewardship principles were 6.7 and 4.9 respectively, indicating moderate knowledge but notable gaps in formal stewardship training. Attitudinal analysis showed that 78.4% of practitioners agreed that fear of complications influenced their decision to prescribe antibiotics. Patient demand was acknowledged as a pressure point by 65.2% of respondents, while time constraints (61.9%) and lack of diagnostic support (54.7%) were also commonly cited as barriers to rational prescribing.

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Table 1: Demographics and Outcome

Demographic Variable	Value
Total Participants	480
Mean Age (years)	38.2
Male (%)	58.3
Urban Practice (%)	66.7
Private Sector (%)	54.1
Mean Years of Practice	12.6

Table 2: Antibiotic Prescription Patterns by Clinical Scenario

Clinical Scenario	Antibiotic Prescribed (%)	Inappropriate Prescriptions (%)
Upper Respiratory Tract Infection (URTI)	72.5	65.1
Diarrhea	48.3	41.2
Skin Infections	80.6	29.7
Urinary Tract Infection (UTI)	85.2	19.3
Fever (undifferentiated)	34.1	70.5

Table 3: Knowledge Scores on Antibiotic Use and Resistance

Knowledge Domain	Mean Score (out of 10)	Standard Deviation (SD)
Antimicrobial Resistance Awareness	8.1	1.2
Guideline Familiarity	5.3	1.9
Resistance Pattern Knowledge	6.7	1.5
Stewardship Principles	4.9	2.1

Table 4: Attitudinal Factors Influencing Antibiotic Prescription

Influencing Factor	Agree (%)
Fear of complications	78.4
Patient demand	65.2
Time constraints	61.9
Lack of diagnostic tools	54.7

Table 5: Prescriber Confidence and Decision-Making Support

Statement	Agree (%)
Confident in identifying cases requiring antibiotics	59.3
Feels adequately trained in antibiotic stewardship	42.8
Finds existing guidelines easy to apply	38.6
Needs more training and updates on antibiotic use	76.5

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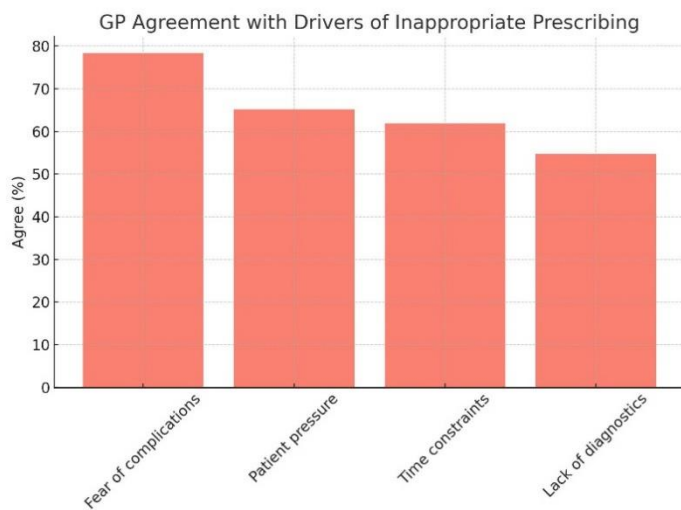Social Sciences ■ ■ ■

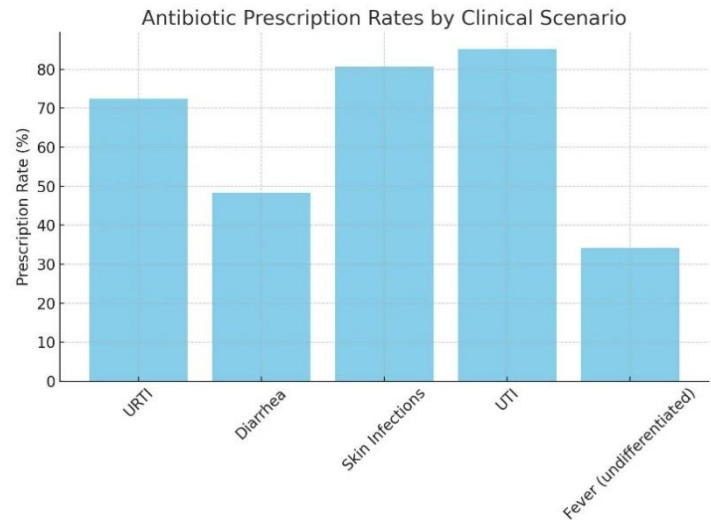*Figure 1 GP Agreement with Drivers of Inappropriate Prescribing*

Figure 2 Antibiotic Prescription Rates by Clinical Scenario

DISCUSSION

The findings of this study underscore a persistent pattern of high antibiotic prescription rates among general practitioners in Pakistan's primary care settings, particularly in conditions like upper respiratory tract infections (URTIs) and urinary tract infections (UTIs), despite growing awareness of antimicrobial resistance. The observation that 65.1% of antibiotics prescribed for URTIs were inappropriate highlights a concerning deviation from evidence-based guidelines, echoing similar findings from studies conducted in Europe and Australia where guideline non-compliance remains a common issue (14,15). A key strength of this study lies in its large, geographically diverse sample, offering a comprehensive overview of GP prescribing practices across urban and rural Pakistan. The use of validated survey tools and stratified sampling enhanced both the representativeness and reliability of the findings. The robust statistical methods applied, including ANOVA and chi-square tests, ensured accurate interpretation of associations between demographic variables and prescribing behavior. When compared with global data, the high rates of inappropriate prescriptions in this study align with earlier literature identifying patient pressure, diagnostic uncertainty, and fear of complications as significant contributors to antibiotic overuse (16,17). The findings reinforce that cultural expectations and physician workload, rather than clinical necessity, often shape prescription decisions. The attitudinal results in this study—where 78.4% of practitioners cited fear of complications and 65.2% cited patient expectations—are consistent with prior qualitative research documenting how implicit assumptions about patient desires influence prescribing behaviors (18).

Although antimicrobial resistance awareness among the surveyed GPs was relatively high (mean score 8.1/10), familiarity with stewardship principles and formal guidelines remained suboptimal, a gap similarly highlighted in recent European and Asian studies (19,20). This underlines the need for more accessible and context-specific training programs, as well as integration of antimicrobial stewardship into national continuing medical education. Despite its strengths, the study does carry certain limitations. First, the reliance on self-reported data introduces the possibility of social desirability bias, wherein practitioners may underreport inappropriate prescribing. Second, while the study achieved good regional coverage, it may not fully account for differences in prescription patterns between highly urbanized zones and underserved rural clinics with resource constraints. The study also did not include prescription audits, which could have provided a more objective verification of reported practices. Furthermore, while the cross-sectional design offered a useful snapshot, it limits causal interpretations and temporal analysis. Future research would benefit from longitudinal designs that assess changes in prescription behaviors over time, particularly in response to interventions like educational campaigns or digital decision-support systems. Incorporating prescription audits, clinical record linkage, and patient outcomes would enhance validity and allow correlation between prescribing trends and resistance patterns.

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The implications of these findings are significant. The high levels of inappropriate antibiotic use emphasize an urgent need to implement scalable interventions. Evidence from European interventions has shown success with strategies such as delayed prescribing, audit-feedback systems, and social norm-based peer benchmarking (21). Adapting such approaches to the Pakistani context, potentially through public-private collaborations and enhanced regulation, could yield meaningful improvements. In conclusion, the study adds to the growing body of evidence documenting suboptimal antibiotic prescription practices in primary care. By illuminating knowledge gaps, attitudinal drivers, and system-level barriers, it provides a vital baseline for policymakers and healthcare educators aiming to combat antimicrobial resistance. National stewardship programs must address both technical and behavioral dimensions of antibiotic use, guided by localized data and frontline practitioner insight.

CONCLUSION

This study highlights a significant prevalence of inappropriate antibiotic prescriptions among general practitioners in Pakistan, driven by clinical, attitudinal, and systemic factors. Despite good awareness of antimicrobial resistance, gaps in guideline adherence and stewardship knowledge persist. These findings emphasize the urgent need for targeted interventions, policy reinforcement, and context-sensitive educational programs to promote rational antibiotic use in primary care.

AUTHOR CONTRIBUTION

Author	Contribution
Tooba Shaikh*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Maira Amjad	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muhammad Ahmed Aftab	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Bheesham Kingrani	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Sana Ilyas	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Mashkoor Ahmed Ansari	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Zoha Mehmood	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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