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ORIGINAL ARTICLE

Knowledge, attitude, and practices of hospital and community pharmacy staff towards antimicrobial stewardship program in Islamabad, Pakistan

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A B S T R A C T

Introduction: Worldwide, antimicrobial resistance (AMR) is a growing threat to public health. Considerable evidence suggests that the knowledge and attitude among the hospital and community pharmacy staff (HCPS) can play a vital role in the evidence-based dispensing of antibiotics. This study aimed to evaluate the knowledge, attitudes, and practices (KAP) of HCPS towards antimicrobial stewardship programs (ASP) in the Capital City of Pakistan.

Methodology: A cross-sectional survey was conducted from February to May 2022 among HCPS (n = 385) using a validated questionnaire. Various statistical tests were used to analyze the data.

Results: Overall response rate was 96% (385/400). Most participants (55.3%) were aged 18-24 years, with 40% holding an undergraduate education, and 32.2% were licensed pharmacists. A significant proportion (61.6%) worked in community pharmacies. Overall, participants exhibited good knowledge (median (IQR) = 4 (3-5)) and practice (22 (20-23)) related to rational antibiotic use and dispensing, with an excellent attitude (5 (1-7)) toward ASP. KAP scores varied significantly across demographic factors such as gender, age, education level, occupation, and pharmacy type.

Conclusion: The participants exhibited good knowledge and positive attitudes toward ASP. However, practices were substantially up to the mark. Based on the current study's results, the drug regulatory authority of Pakistan should reinforce regulations on the dispensing of non-prescription antibiotics. Moreover, HCPS should be more vigilant regarding the consequences of AMR.

Keywords: *Hospital pharmacist; Community pharmacist; Antimicrobial stewardship program; Knowledge; Attitude; Practice; Antibiotic resistance*

Introduction

Antimicrobial resistance (AMR) has been declared a major global health threat by the World Health Organization (WHO) and is recognized as a significant concern of the 21st century.[1] AMR reduces the effectiveness of antibiotics, contributing to approximately 700,000 deaths annually, with a projected significant increase to 10 million deaths per year by 2050.[2,3] Furthermore, AMR is projected to cost the global economy more than $100 trillion by that same year.[4] The consequences of AMR are especially severe in developing countries leading to higher morbidity and mortality rates. Furthermore, it also burdened the healthcare system by increasing treatment costs and complicating the management of infectious diseases.[5] Pakistan is the third leading consumer of antibiotics in low-income countries.[6] An estimated 50% of these antibiotics are inappropriately prescribed. WHO ranks Pakistan as

fifth in the burden of multidrug-resistant (MDR) tuberculosis. Additionally, the country has experienced 2 outbreaks of MDR Salmonella infections (100% resistant to fluoroquinolones) and is still struggling with AMR pneumococcal infections, which kill 20,000 children under the age of 5 years.[7] Drivers of the emergence of AMR in Pakistan are embedded in both less awareness among the public and the dispensing of antibiotics without prescription.[8,9]

Additionally, the situation is further exacerbated by the limited availability of hospital and community pharmacy staff (HCPS). These staff often lack awareness of the risks associated with dispensing non-prescribed antibiotics and emerging resistance patterns.[10] Therefore, Antimicrobial stewardship programs (ASPs) have been developed as a critical intervention to address AMR by promoting the appropriate use of antibiotics.[11,12] These programs aim to limit antimicrobial therapy to those infections less likely to benefit from such treatments, shorten treatment durations, and reduce the use of broad-spectrum antimicrobials to reduce collateral damage.[13] ASPs have also been shown to significantly reduce antimicrobial consumption, lower associated costs, minimize resistance, and improve patient outcomes, including a reduction in the length of hospital stay.[10,12]

Globally, pharmacies and medical stores are integral to healthcare systems and play a vital role in medication-provision services.[14] HCPS are responsible for verifying the legality, safety, and appropriateness of the prescription and its order, checking patients' medication records, and collaborating with healthcare providers to optimize patient care.[15,16] Therefore, HCPS's involvement is crucial to the success of antimicrobial campaigns and the effective implementation of ASPs in hospital and community settings.

Several published international studies have assessed the knowledge, attitude, and practices (KAP) of HCPS towards rational antibiotic dispensing and ASP in countries including Malaysia, China, India, Iraq, Saudi Arabia, Sri Lanka, and Zambia.[17-22] Similar research in Pakistan has been limited. Most existing studies have focused on specific cities, such as Lahore, or national surveys, that primarily examined hospital pharmacy staff. To date, no study has comprehensively explored the KAP of both HCPS in Pakistan's Capital City, Islamabad.[23,13]

Thus, this study aimed to fill the gap by assessing the KAP of HCPS regarding antibiotic use, AMR, and ASP in Islamabad. Understanding the knowledge gaps and challenges faced by HCPS in the Capital City is essential for designing targeted interventions to improve the rational use of antibiotics and strengthen the implementation of ASPs, ultimately contributing to the control of AMR in Pakistan.

Methodology

A cross-sectional survey was conducted from February to May 2022 using a self-administered online questionnaire in Islamabad, Pakistan. There are approximately 15 hospitals and 297 pharmacies in Islamabad. Data was collected from HCPS working in different hospitals and community pharmacies in Islamabad. The study participants included HCPS who met the following inclusion criteria: Aged ≥ 18 years, currently working in hospital or community pharmacies, including retail pharmacies and medical stores, and able to provide informed consent. The following participants were excluded from the study; Physicians (including all specialties), nurses, and physiotherapists.

A total of 400 participants were approached, with 385 responding (96% response rate). The sample size was calculated using the WHO sample size calculator for the cross-sectional study. A convenience sampling method was employed to collect data. Data was collected using a self-administered questionnaire, which was adapted and modified from a similar study on the KAP of healthcare professionals toward ASP.[24,18] Three experts, two from pharmacy practice and one from public health, pre-validated the questionnaire to ensure its accuracy, clarity, and simplicity. Based on their feedback, changes were made.

The final questionnaire was converted into an online Google Form and circulated via WhatsApp, other social media platforms (such as Facebook and Instagram), and physical visits to hospitals and community pharmacies in the Islamabad region. The questionnaire consisted of four parts with 22 questions. The first section included six questions on the demographics of the participants, such as gender, age, education level, occupation, experience, and working pharmacy type. The second section had six questions related to the knowledge of participants about

antibiotics and their resistance. The responses to these questions were "True" and "False". Scores were calculated by assigning one point to each correct item. Participants had excellent knowledge if the score was 5-6, good if 3-4, and poor if 1-2. The third section had 5 questions related to attitudes toward ASP. A 5-point Likert scale was used to record the responses, using 5 for "strongly agree", 4 for "agree", 3 for "neutral", 2 for "disagree", and 1 for "strongly disagree". The attitude score was categorized into three levels indicated by poor (less than 10), good (10-17), and excellent (18-25). The fourth section had five questions on participants' practices regarding rational antibiotic dispensing and was rated with a semantic differential scale, with responses recorded as "always = +2", "often = +1", "occasionally = -1", and "never = -2". The practice score was categorized into three levels i.e., poor = ≤4, good = 5-7, and excellent = 8-10 (Supplementary file No. 1; Questionnaire).

Descriptive statistical analysis was performed using SPSS version 20.0, with frequencies and percentages reported. The Kolmogorov-Smirnov test was used to assess the normality of the data. Given the non-normal distribution of the data, non-parametric tests (Mann-Whitney and Kruskal-Wallis) were used to assess differences in median scores across variables. The Mann-Whitney test was performed for a comparison of differences between two independent groups. The Kruskal-Wallis's test was performed to compare the median of three or more independent groups. A p-value of less than or equal to 0.05 was considered statistically significant. This means there is a 95% probability that the observed results in the study reflect a true relationship or difference between the groups being compared. It also indicates that there is only a 5% chance that the results occurred by random chance, with no true relationship existing between the groups.

Results

A total of 385 respondents completed the survey questionnaires, with males being the majority (69.6%). Most (55.3%) participants were aged 18 to 24 years, educated up to an undergraduate level (40%), and were licensed pharmacists (32.2%). More than one-half of the participants (55.6%) had 1 to 2 years of experience. Community pharmacies have the highest representation (61.6%) in the sample (Table 1).

Table 1: KAP scores of HCPS regarding antibiotics, resistance, and ASPs

Variables	Frequency (%)	Knowledge score		Attitude score		Practice score	
		Median (IQR)	p-value	Median (IQR)	p-value	Median (IQR)	p-value
Gender*							
Male	268 (69.6)	3 (2)	<0.001	22 (4)	0.4	6 (4)	0.03
Female	117 (30.4)	4 (2)		22 (3)		5 (6)	
Age (years)**							
18-24	213 (55.3)	3 (3)	<0.001	22 (3)	0.5	5 (6)	0.04
25-34	116 (30.1)	5 (3)		22 (4)		6 (3)	
35-44	37 (9.6)	4 (4)		21 (5)		4 (7)	
45-54	15 (3.9)	4 (4)		22 (5)		3 (6)	
≥55	4 (1.0)	6 (2)		23 (2)		6 (2)	
Education**							
Health diploma holder	37 (9.6)	3 (2)	<0.001	20 (4)	<0.001	3 (9)	0.02
College	39 (10.1)	5 (3)		20 (5)		4 (7)	
Graduate	120 (31.2)	4 (3)		22 (4)		6 (3)	
High school	35 (9.1)	6 (3)		22 (1)		3 (8)	
Under-graduate	154 (40)	4 (2)		22 (3)		6 (6)	

Occupation**							
Dispenser	38 (9.9)	4 (3)	<0.001	22 (5)	<0.001	4 (6)	<0.001
General staff	41 (10.6)	3 (3)		21 (4)		3 (8)	
License pharmacist	124 (32.2)	4 (2)		22 (3)		6 (4)	
Manager	43 (11.2)	4 (3)		22 (4)		6 (5)	
Other(volunteer)	88 (22.9)	4 (2)		22 (3)		5 (6)	
Pharmacy Technician	51 (13.2)	3 (2)		20 (2)		4 (6)	
Experience**							
3 to 5 years	85 (22.1)	4 (2)	0.02	22 (4)	0.01	5 (7)	0.7
5 to 10 years	52 (13.8)	4 (2)		20 (5)		5 (6)	
Less than 3 years	214 (55.6)	4 (3)		22 (3)		6 (6)	
≥10 years	33 (8.6)	4 (4)		20 (5)		5 (4)	
Type of Pharmacy**							
Chain pharmacy	42 (10.9)	4 (3)	0.5	20 (6)	0.004	5 (6)	0.02
Hospital pharmacy	148 (38.4)	4 (2)		22 (3)		5 (4)	
Independent pharmacy	126 (32.7)	4 (3)		21 (3)		6 (6)	
Medical store	69 (17.9)	4 (4)		22 (4)		3 (9)	

*** Mann Whitney U test performed**
****Kruskal Wallis test performed**

The median (IQR) knowledge score was 4 (3-5), representing that most of the respondents had good knowledge about antibiotic use. Most of the participants were able to know that antibiotics are not the first choice of treatment for inflammation (54%) and common cold and sore throat (59%). Around 61% of the participants incorrectly answered the statement that antibiotics have a role in the prophylaxis of future infections. Furthermore, most of the participants were aware of the consequences of antibiotic resistance i.e., patient non-compliance with antibiotics (85%), longer hospital duration (87%), and missing doses (58%) (Figure 1).

The Median (IQR) attitude score was 22 (20-23), representing that the participant's attitude toward ASPs was positive/excellent. Approximately, 42% of participants "strongly agreed" on the implementation of ASP. A substantial portion of participants (48%) "agreed" and (32%) "strongly agreed" that the implementation of ASP would contribute to a reduction of AMR. Most participants (56%) "strongly agreed", and (30%) "agreed" that adequate training should be provided to pharmacy staff regarding the appropriate utilization of antimicrobials. Moreover, most of the participants (54%) believed that antibiotics are over-prescribed in Pakistan. Most of the participants "strongly agreed" (47%) and (36%) "agreed" that "Self-medication and wrong diagnosis are the main sources of antibiotic resistance" (Figure 2).

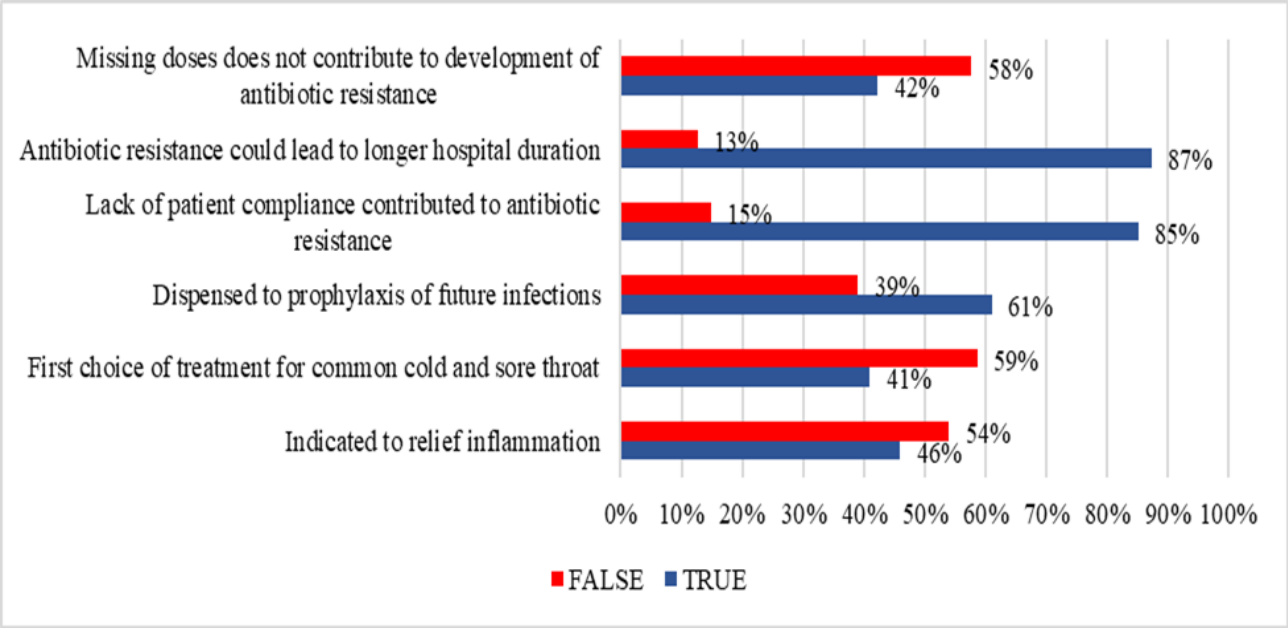

Figure 1: Knowledge of the study participants regarding antibiotic use and resistance

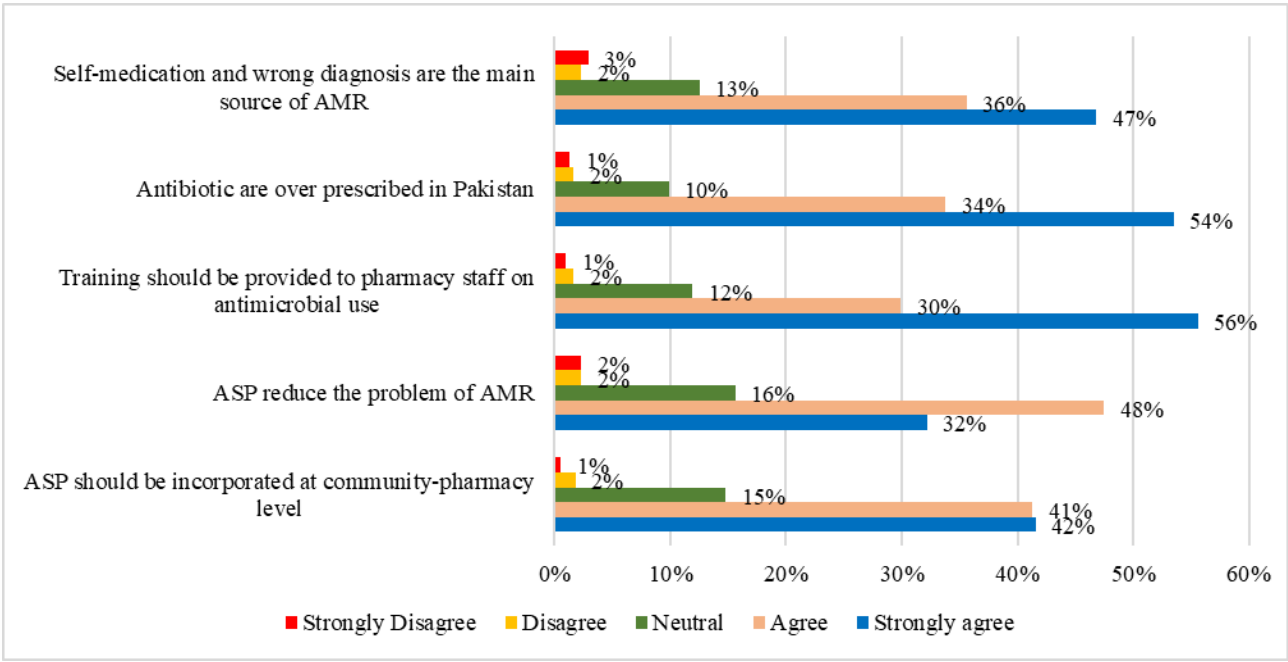

Figure 2: Attitudes of the study participants toward ASPs

The median (IQR) practice score was 5 (1-7) representing good practice towards appropriate dispensing of antibiotics. About 47% of respondents "often" educate patients regarding the adverse effects of using antimicrobial medications. A total of 35% of HCPS stated that they "occasionally" asked for a prescription before selling antibiotics. Regarding the assessment of medical and medication history, 39% stated that they "always" inquired when dispensing antibiotics without a prescription. When dispensing prescribed antibiotics for children, 48% stated that they "always" checked the dose. In terms of patient education on adherence to antibiotics, 46% "always" provided information about the completion of the antibiotic course (Figure 3).

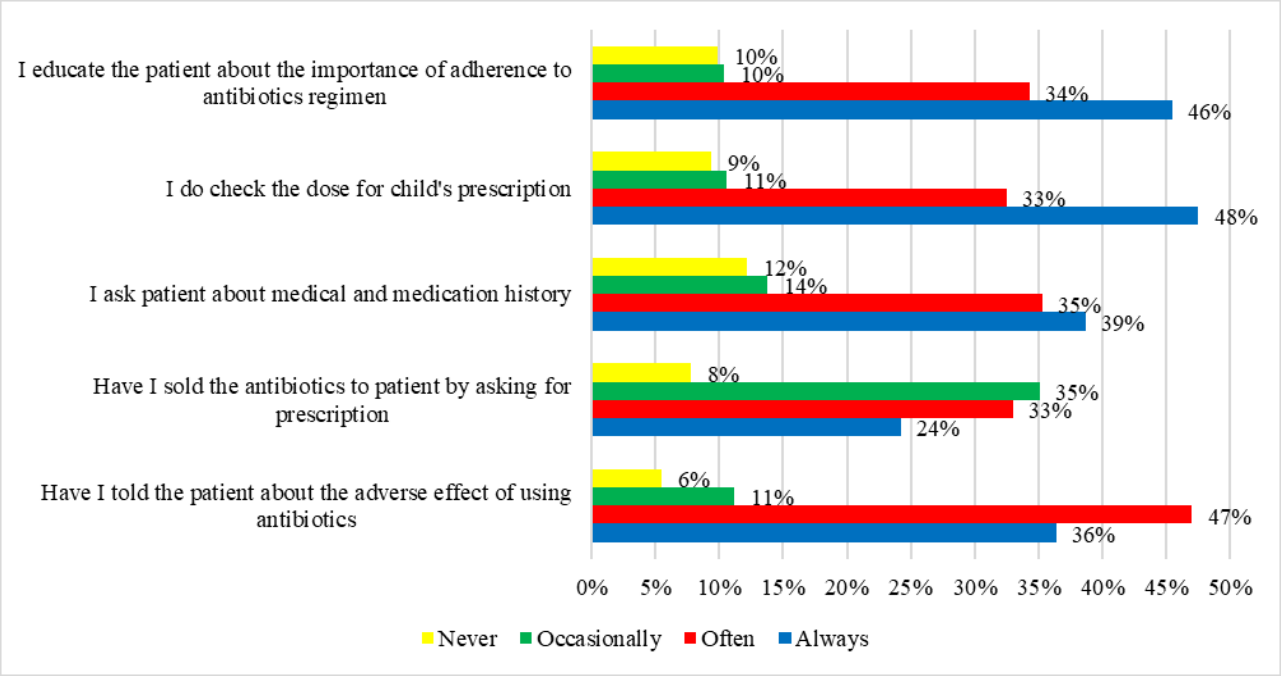

Figure 3: Practice of the study participants regarding rational antibiotics dispensing

Most of the HCPS have a "good" level of knowledge (n=39%) with a score range of 3-4, an "excellent" attitude (n=90%) with an 18-25 score range, and "poor" practice (n=41%) with a score of less than 4, toward antibiotics, resistance, and ASP (Supplementary file No. 3). The KAP levels related to antibiotics were stratified across different participant characteristics, including gender, age, education, occupation, experience, and type of pharmacy (Supplementary file No. 2).

Table 1 depicts differences in the median KAP scores of HCPS regarding antibiotics, resistance, and ASPs. There is a statistically significant difference in HCPS knowledge median score across gender ($p<0.001$), age groups ($p<0.001$), education levels ($p<0.001$), occupation ($p<0.001$), and experience ($p=0.02$). While, concerning the HCPS attitude median score, there is a statistically significant difference across education level ($p<0.001$), occupation ($p < 0.001$), experience ($p=0.01$), and working pharmacy type ($p=0.004$). Additionally, for the practice median score, a statistically significant difference was observed across gender ($p=0.03$), age groups ($p=0.04$), education levels ($p=0.02$), occupation ($p<0.001$), and type of pharmacy ($p=0.02$).

Discussion

The regulation and sale of antibiotics in pharmacies and medical stores are usually restrained at a low level in developing countries.[25] Licensed pharmacists are mostly not available for the dispensing of antibiotics and where available they lack proper knowledge and attitude toward rational antibiotic dispensing. HCPS knowledge, attitude, and practice related to antibiotic indications, resistance, and ASP are important for rational dispensing of antibiotics.[10,25] This study evaluated the KAP of HCPS regarding the concern. The current study can provide local data for the policymakers to implement ASP in community pharmacies and hospital pharmacies.

Knowledge related to antibiotic use, effects of patient non-compliance, factors causing antibiotic resistance, and after effects of antibiotic resistance help in the reduction of antibiotic irrational dispensing and resistance.[10,26] Our participants represent a good level of knowledge in these aspects as previously reported nationally and internationally, such as in Pakistan (Lahore), Sri Lanka, Hungary, and China.[10,18,23,27] This good level of knowledge indicates that our pharmacists know respect for antibiotics and resistance consequences.[23] This means the curriculum of our pharmacy profession enriches them with

relevant knowledge. HCPS are among the active members of ASP. Their involvement in ASP could effectively implement the program leading to a reduction in hospital stay and healthcare costs and improving patient condition/clinical outcomes.[15] HCPS should be encouraged to take part in training sessions regarding the rational use of antimicrobials and appropriate dispensing, and our participants were also of the same view.[21] The positive/excellent attitude related to ASP implementation and training, as reported by our participants is also consistent with other studies.[13,21,28] Our findings are important, as the positive perceptions of pharmacists strengthen the concept of developing ASP for pharmacies in Pakistan. When pharmacists are trained regarding ASP, they can help in the upgradation of these programs in pharmacy settings as well as hospital settings. This will reduce antibiotic resistance at the level of dispensing antibiotics.

Practice-related concerns by HCPS, such as education and counseling regarding antibiotic use, antibiotic dispensing based on prescription only, and asking for medication history during antibiotic dispensing, are crucial for effective antibiotic provision.[15,17] This practice of rational antibiotic dispensing is somewhat followed by participants included in this study (median practice score at a good level but the majority of the participants' score was at a poor level) and reported by previous studies.[10,17]

Different factors of HCPS contribute differently to KAP related to antibiotics, their resistance, and ASP. Our results indicate that the median knowledge score was different across gender, age group, education level, occupation, and experience. We observed that males, HCPS age ≥ 55 years, graduates, licensed pharmacists, and having experience had high knowledge scores in comparison to others which differs from previous reports.[18,23] While, concerning HCPS attitude median score, it was different across HCPS education level, occupation, experience, and working pharmacy type. Whereas, the practice median score was different across genders, age groups, education levels, occupation, and type of pharmacy. These findings do not follow a study from China, where only education, experience, and licensed pharmacists contribute practices toward ASP.[18] Thus age, experience, and education of pharmacists have a high impact on KAP related to antibiotic use, resistance, and ASP. Currently, in Pakistan, an established ASP doesn't exist in pharmacy settings.[13,26] Although, it is a positive indication that HCPS are aware of their roles in ASP; it is necessary to utilize their positive understanding regarding ASP by including them in the force required for the development and implementation of ASP at community levels.[13,21]

There are several limitations to our study. First, it was conducted in the Capital City of Pakistan, so results may not be generalizable to the HCPS across the entire country. It doesn't provide the whole picture of Pakistani HCPS. Future studies should include HCPS across different provinces of Pakistan to provide an overall result. Secondly, data was collected through a self-administered questionnaire, and due to differences in participants' demographics, it may negatively impact the current results. Qualitative studies could offer deeper insights into the perceptions and views of individual HCPs regarding the current issue. Despite these limitations, the current study provides up-to-date insight into HCPS's KAP towards community-based ASPs. The findings of this study will contribute to the future development and implementation of ASPs in pharmacy settings in Pakistan.

Conclusion

The overall participants' level of knowledge related to antibiotic use and resistance was good, their attitude regarding ASPs was positive, and practices regarding rational antibiotic dispensing were substantially up to the mark. The lack of active policies and guidelines regarding ASP potentially contributes to high AMR rates in Pakistan. The drug regulatory authority of Pakistan should regulate and monitor the process of dispensing antibiotics without prescription. Moreover, interventions should be conducted in the weak areas highlighted by this study to improve the knowledge and practices of HCPS.

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