



Original Article

KNOWLEDGE, ATTITUDE, AND PRACTICE OF PHARMACISTS IN PAKISTAN REGARDING PHARMACEUTICAL PRODUCT RECALL

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ABSTRACT

Pharmaceutical product recalls are essential for safeguarding public health by removing defective, unsafe, or substandard medicines from circulation. Pharmacists play a key role in identifying, communicating, and managing recalled products; however, evidence regarding their preparedness in Pakistan remains limited. A cross-sectional KAP survey was conducted among pharmacists working in clinical, industrial, hospital, community, retail, and academic settings across Pakistan. A structured and internally validated questionnaire assessed participants' knowledge, attitudes, and practices related to pharmaceutical product recalls. Reliability was evaluated using Cronbach's alpha. Descriptive statistics, Mann-Whitney U, Kruskal-Wallis, and correlation analyses were performed. A total of 106 pharmacists participated, including 49.1% males and 50.9% females. Most respondents demonstrated good awareness regarding recall definitions, recall classifications, and the importance of timely communication during recalls. More than 95% supported immediate recalls for safety concerns, while 97.2% emphasized timely communication with healthcare professionals and the public. Despite positive knowledge and attitudes, practical exposure was limited, with only one participant reporting direct experience handling a recall. Approximately 38.7% reported never receiving recall-related information from authorities or manufacturers. Significant differences were observed in knowledge scores across gender ($p = 0.004$) and practice scores across professional domains ($p = 0.034$). Positive correlations were identified between knowledge, attitude, and practice scores. Pakistani pharmacists demonstrated good knowledge and positive attitudes toward pharmaceutical product recalls; however, practical engagement and communication systems remain inadequate. Strengthening recall reporting systems, communication channels, and practical training may improve recall preparedness and patient safety outcomes.

Key Words: Product recall, Pharmacovigilance, Patient Safety, Pharmacists

INTRODUCTION

A pharmaceutical product recall is an important regulatory action in the product life cycle. It involves the removal or withdrawal of a product from the market to protect the public from defective or potentially harmful medicines. A recall is required when a product poses a health risk because of manufacturing defects or when it is identified as substandard, falsified, or spurious. Product recall is a key outcome of pharmacovigilance and an essential part of drug regulation (1). Inadequate quality control during manufacturing can result in the production and distribution of low-quality medicines. Poor-quality medicines may also enter the market through deliberate falsification (2). The relative contribution of these two sources is unclear. However, substandard but legitimate pharmaceutical

products may be more common and may pose a greater risk to patient health. Current regulations often focus more on intentionally falsified products, but both issues require effective control (3). This study aimed to assess the knowledge, attitudes, and practices of pharmacists in Pakistan regarding pharmaceutical product recalls. Pharmaceutical product recalls may be voluntary or statutory (4). Voluntary recalls usually occur when a product shows defects in quality, safety, or efficacy, whereas statutory recalls are initiated under the direction of drug regulatory authorities (4).

Pharmacists have an important role in recall management because they identify recalled products, remove them from use, communicate recall information, counsel affected patients, and report relevant findings to regulatory authorities (5). Drug recalls are issued when products present problems related to quality, safety, or effectiveness, including substandard or counterfeit medicines, serious adverse reactions, fatalities, or products with suspended or cancelled licenses (6, 7). This study assessed the knowledge, attitude, and practice of the pharmacist community in Pakistan regarding pharmaceutical product recalls.

METHODOLOGY

Study Setting and Participants

This was a cross-sectional survey-based study and data were collected through a structured online questionnaire using Google Forms. Participants were recruited by convenience sampling. Pharmacists from clinical, community, retail, hospital, industrial, and academic settings were included. Informed consent was obtained before participation. The questionnaire included sections on demographics, knowledge, attitudes, practices, recall-related actions, and satisfaction with the recall system. Demographic variables included age, gender, and education level. The knowledge section contained 8 items, the attitude section contained 5 items, and the practice section contained 4 items. The questionnaire also covered recall definitions, recall classification, communication channels, patient safety, actions taken during recall events, willingness to provide updates, and preferred reporting methods. This broad professional representation allowed assessment of recall-related knowledge, attitudes, and practices across multiple pharmacy settings.

Ethical approval was obtained from the Ethical Review Committee of Hamdard University under reference number FOP-ERC-04-12. The purpose of the study was explained to all participants before data collection. Written informed consent was obtained before questionnaire completion. The questionnaire was reviewed by experts for face and construct validity, and their suggestions were incorporated into the final version. A pilot study was then conducted with 30 respondents. Internal reliability was assessed using Cronbach's alpha.

KAP Scoring

The Knowledge, Attitude, and Practice scoring system was used to assess participants' responses regarding pharmaceutical product recalls. Each item was scored on a five-point Likert scale ranging from 1 to 5, as described in Supplementary S1. Scores for items within each domain were added to obtain the total score. The maximum score was 40 for knowledge based on 8 items, 20 for attitude based on 4 items, and 10 for practice based on 2 items.

RESULTS

Demographics

Among 106 respondents, 52 (49.1%) were male and 54 (50.9%) were female. Most participants had a bachelor's degree (73, 68.9%), followed by a master's degree (31, 29.2%), while 2 (1.9%) had a PhD. By professional domain, 8 (7.5%) were clinical pharmacists, 44 (41.5%) were industrial pharmacists, 16 (15.1%) were community or retail pharmacists, 18 (17.0%) were hospital pharmacists, and 20 (18.9%) belonged to other categories. The median age was 27.0 years, with a 95% confidence interval of 27.0 to 28.0 years. The median professional experience was 3 years, with a 95% confidence interval of 3 to 4 years. These data are presented in Table 1.

The internal consistency of the study domains was assessed using Cronbach's alpha. The knowledge domain, which included eight items, showed moderate reliability with an alpha value of 0.639. The attitude domain, based on four items, also showed moderate internal consistency with an alpha of 0.643. The practice domain, which contained two items, showed comparatively higher reliability with an alpha of 0.737.

Knowledge, Attitude, and Practice of the Pharmacist Community in Pakistan Regarding Product Recalls

Pakistani pharmacists showed good knowledge of pharmaceutical product recalls. Most respondents understood the definition of a product recall and the distinction between Class I, Class II, and Class III recalls. Most also supported immediate recall for serious safety concerns and recall for minor quality defects to protect patient safety. Participants recognized the public health importance of recalls, supported removal of related products from shelves, and considered timely communication with healthcare professionals and the public essential. Many also reported confidence in the steps required during a recall.

Table 1: Demographic characteristics of respondents

Category	Indicators	N (%)
Gender	Male	52 (49.1%)
	Female	54 (50.9%)
Qualification	Bachelor	73 (68.9%)
	Masters	31 (29.2%)
	PhD	2 (1.9%)
Domain	Clinical Pharmacist	8 (7.5%)
	Industrial Pharmacist	44 (41.5%)
	Community/Retail Pharmacist	16 (15.1%)
	Hospital Pharmacist	18 (17.0%)
	Other	20 (18.9%)

These findings are presented in Table 2. Attitudes toward pharmaceutical product recalls were positive. Most respondents believed that pharmaceutical companies should be responsible for issuing recalls. Most also supported the involvement of regulatory authorities and healthcare providers in mock recall exercises and favored improvement of recall communication channels. Many agreed that companies should take immediate action when safety concerns are identified and reported confidence in recognizing and responding to recall events. These findings are presented in Table 2. In contrast, recall-related practice was limited. Follow-up after recall events was poor, and regular submission of updates was uncommon. Receipt of recall information was also low. Reporting practices were suboptimal, as most respondents preferred reporting recall actions to the press, while fewer reported to the pharmaceutical company, the Drug Regulatory Authority, or their immediate manager. Overall, the findings indicate a gap between recall knowledge and practical implementation.

After receiving a product recall notice, respondents reported different intended actions. Most pharmacists (64.2%) stated that they would contact the manager. In addition, 29.2% reported that they would remove the product from pharmacy shelves. A smaller proportion (6.6%) stated that they would inform patients about the recall.

The comparison of KAP scores by gender showed that male participants had a higher mean knowledge score (32.48 ± 4.25) compared to females (30.72 ± 4.60). Practice scores were relatively similar between the two groups, with males scoring 16.44 ± 3.10 and females 16.00 ± 3.25 . In contrast, female participants demonstrated a slightly higher mean attitude score (7.46 ± 1.15) than males (7.31 ± 1.20), indicating minimal variation between genders across the assessed domains.

Assessment of Knowledge, Attitude, and Practice Scores among Genders

Gender was significantly associated with knowledge scores ($U = 951.000$, $p = 0.004$). In contrast, attitude scores ($U = 1225.500$, $p = 0.245$) and practice scores ($U = 1479.500$, $p = 0.625$) did not differ significantly by gender. Across qualification groups, knowledge scores ($p = 0.070$) and practice scores ($p = 0.086$) showed no significant difference, whereas attitude scores differed significantly ($H = 6.11$, $p = 0.047$). Pairwise analysis showed no significant difference in knowledge scores between bachelor's and master's groups (test statistic = -6.704 , $p = 0.294$). However, attitude scores differed significantly between bachelor's and PhD groups (test statistic = -49.647 , $p = 0.020$), and practice scores differed significantly between master's and PhD groups (test statistic = -42.944 , $p = 0.048$). Across professional domains, knowledge scores ($H = 1.706$, $p = 0.790$) and attitude scores ($H = 2.207$, $p = 0.698$) showed no significant difference, while practice scores differed significantly ($H = 10.443$, $p = 0.034$). Gender was analyzed using the Mann–Whitney U test, whereas qualification and professional domain were analyzed using the Kruskal–Wallis test. These findings are presented in Figure 1.

Table 2: Pharmacists' responses regarding knowledge, attitude, and practices about drug recalls

Questions / Indicators	SD N (%)	D N (%)	N N (%)	A N (%)	SA N (%)
Knowledge					
I am aware of the definition of a pharmaceutical product recall.	1 (0.94)	1 (0.94)	2 (1.89)	48 (45.28)	54 (50.94)
I know the difference between Class I and Class II recalls.	1 (0.94)	5 (4.72)	13 (12.26)	53 (50.00)	34 (32.08)
A pharmaceutical product recall should be initiated even for minor quality issues to ensure patient safety.	2 (1.89)	2 (1.89)	1 (0.94)	63 (59.43)	38 (35.85)
Pharmaceutical product recall is a serious issue that affects patient safety and public health.	–	1 (0.94)	6 (5.66)	64 (60.38)	35 (33.02)
If a product recall is announced for a specific batch, all products of that name should be removed from shelves.	2 (1.89)	9 (8.49)	4 (3.77)	57 (53.77)	34 (32.08)
Pharmaceutical companies should recall a product immediately if it is found to have a serious safety issue.	–	–	1 (0.94)	57 (53.77)	48 (45.28)
Timely communication with healthcare professionals and the public during a product recall is essential.	–	1 (0.94)	2 (1.89)	66 (62.26)	37 (34.91)
I know the steps to take when a pharmaceutical product recall is issued.	1 (0.94)	13 (12.26)	7 (6.60)	64 (60.38)	21 (19.81)
Attitude					
I think that pharmaceutical companies should be held accountable for issuing recalls.	–	–	9 (8.49)	78 (73.58)	19 (17.92)
Should mock recall exercises involve relevant stakeholders like regulatory agencies and healthcare providers?	1 (0.94)	2 (1.89)	13 (12.26)	70 (66.04)	20 (18.87)
I believe that communication channels for pharmaceutical product recalls could be improved.	1 (0.94)	–	3 (2.83)	71 (66.98)	31 (29.25)
Companies should take immediate action, including recalling products, when they discover a safety concern.	1 (0.94)	–	3 (2.83)	71 (66.98)	31 (29.25)
I feel confident in my ability to identify and respond to a pharmaceutical product recall.	1 (0.94)	11 (10.38)	8 (7.55)	65 (61.32)	21 (19.81)
Practice					
Questions / Indicators	Always N (%)	Often N (%)	Sometimes N (%)	Rarely N (%)	Never N (%)
How likely are you to submit updates on actions following a product recall announcement?	9 (8.49)	22 (20.75)	10 (9.43)	15 (14.15)	50 (47.17)
How often do you receive information about pharmaceutical product recalls from authorities or manufacturers?	12 (11.32)	13 (12.26)	13 (12.26)	27 (25.47)	41 (38.68)

SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree.

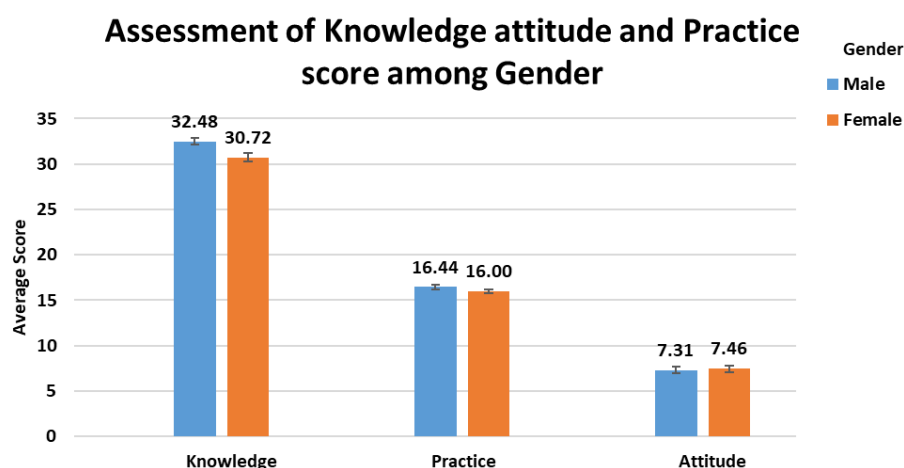


Figure 1: Assessment of knowledge, attitude, and practice scores among genders. Error bars show Mean $\pm$ S.E.

Assessment of Knowledge, Attitude, and Practice across Professional Domains

Knowledge and attitude scores did not differ significantly across professional domains. Knowledge scores showed no significant variation ($p = 0.790$). Attitude scores also showed no significant variation ($p = 0.698$). In contrast, practice scores differed significantly across domains ($p = 0.034$). Pairwise analysis showed differences between the other group and industrial pharmacists ($p = 0.005$), and between community or retail pharmacists and industrial pharmacists ($p = 0.041$). After Bonferroni correction, only the difference between the other group and industrial pharmacists remained significant (adjusted $p = 0.049$). Correlation analysis showed a moderate positive association between knowledge and attitude scores ($\rho = 0.541$, $p < 0.01$). However, practice scores showed weak negative correlations with knowledge scores ($\rho = -0.230$, $p < 0.05$) and attitude scores ($\rho = -0.277$, $p < 0.01$). These findings indicate that professional domain was associated with practice scores but not with knowledge or attitude scores, and that higher knowledge was associated with more positive attitudes, while practice showed an inverse relationship with both knowledge and attitude.

DISCUSSION

This study assessed the knowledge, attitudes, and practices of pharmacists in Pakistan regarding pharmaceutical product recalls. The findings showed good knowledge and positive attitudes toward product recalls. However, practical involvement in recall activities was limited. This result indicates a gap between awareness and actual practice within the pharmaceutical safety system in Pakistan.

Pharmacists showed good knowledge of product recall systems, including recall classification categories. This finding suggests adequate theoretical understanding of recall procedures. Similar results were reported by Shanableh et al. (8), who found high awareness among pharmacists. That study linked awareness to academic training and regulatory communication. In Pakistan, this level of knowledge may also reflect the role of the Drug Regulatory Authority of Pakistan in recall communication (9). However, practical experience with recalls was limited among the participants. This finding indicates a gap between knowledge and implementation. In developed countries, pharmacists appear to have greater practical involvement in recall management. For example, community pharmacists in the United States handle a large number of recalls each year (10, 11). In contrast, the lower number of recalls reported by DRAP may reflect underreporting or limited activation of the recall system. This may reduce pharmacists' practical exposure to recall procedures. DRAP reported 45 recalls in 2022, most of which were Class II or Class III (9).

In this study, pharmacists showed a strong patient safety orientation. Most supported immediate product recalls when safety concerns were identified. Many also supported recalls for minor quality defects. These views are consistent with international pharmacovigilance principles described by the

World Health Organization (12). Most respondents assigned primary recall responsibility to manufacturers, which suggests awareness of accountability within the pharmaceutical supply chain. However, this view may reduce the perceived role of pharmacists in recall implementation. Clear protocols are therefore needed to define shared responsibilities among all stakeholders.

A key finding was the strong support for better recall communication systems and mock recall exercises. This is consistent with earlier studies that identified poor communication as a major barrier to effective recall implementation in low- and middle-income countries (1, 13, 14). However, the reported practices showed gaps in follow-up and reporting after recall events. Many pharmacists were unlikely to submit updates or report directly to regulatory authorities. Most preferred to report to their managers. This pattern may reflect hierarchical and system-related practices in South Asian healthcare settings. Similar findings were reported in Bangladesh, where 70% of drug-related problems were referred to supervisors rather than reported directly to regulatory bodies or the media (15). In contrast, direct reporting systems used by agencies such as the European Medicines Agency may improve accountability and traceability (1).

Correlation analysis supported the KAP framework, but practice gaps remained. These gaps may reflect weak regulatory enforcement, limited infrastructure, and inadequate practical training (20, 21). Pharmacists in Pakistan showed good awareness and positive attitudes toward product recalls, but practical implementation was limited. This may be due to structural and operational barriers. Pakistan's recall system may also be less centralized and less active than those of neighboring countries (22, 23).

Strengthening the national pharmacovigilance system through digital reporting tools and real-time communication platforms may improve recall effectiveness. There are a few limitations of the study including the sample size was small, and the data were self-reported, which may have introduced bias and reduced generalizability. The cross-sectional design also limited causal interpretation. Future studies should include larger multicenter samples and qualitative methods to better identify barriers to effective recall practice.

CONCLUSION

Pakistani pharmacists showed good knowledge and positive attitudes toward pharmaceutical product recalls, but practical involvement remained limited. Improving pharmacovigilance, communication, and recall training may enhance preparedness and patient safety.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

ETHICAL CONSIDERATION

The study was approved by the Ethical Review Committee of Hamdard University (reference number FOP-ERC-04-12). Written informed consent was obtained from all participants prior to data collection.

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