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Original Article

Antidote Availability and Community Pharmacist Preparedness for Acute Poisoning Management: A Cross-Sectional Knowledge, Attitudes, and Practices Study in Lahore, Pakistan

Ahmad Ali[1], Waqas Akram[1], M. Jawad[1], M. Zain[1], Tayyab Saeed[1], Dr. Ali Akhtar[1]

[1]Faculty of Pharmaceutical Sciences, University of Central Punjab, Lahore, Pakistan

***Corresponding author: Dr. Ali Akhtar, aliakhtar5657@gmail.com**

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ABSTRACT

Background: Acute poisoning is a preventable public health emergency requiring timely recognition, referral, and access to appropriate antidotes. Community pharmacists may serve as accessible first-contact healthcare providers, but their preparedness for poisoning management in Pakistan remains underexplored. Objective: To assess antidote availability and community pharmacists' knowledge, attitudes, and practices regarding acute poisoning management in Lahore, Pakistan. Methods: A cross-sectional survey was conducted among 102 community pharmacists using a structured questionnaire. Antidote availability was assessed across 19 selected antidotes and categorized as good when ≥12 antidotes were stocked. Knowledge was assessed using five poisoning scenarios and categorized as good when ≥3 responses were correct. Descriptive statistics and chi-square testing were performed using SPSS version 26.0, with $p < 0.05$ considered statistically significant. Results: All pharmacies had poor antidote availability, with no stocking ≥12 antidotes. Sodium bicarbonate was most available (56.9%), while naloxone and atropine were available in only 16.7% and 36.3% of pharmacies, respectively. Overall, 80.2% of pharmacists had poor antidote knowledge, and professional experience was not significantly associated with knowledge category ($p = 0.876$). Only 20.6% had received formal poisoning-management training, although 87.2% supported ongoing training and 90.2% supported collaboration with poison control centers. Conclusion: Community pharmacies in Lahore are insufficiently prepared for acute poisoning response, requiring structured training, minimum antidote stocking policies, and integration with poison control networks. Keywords: Acute poisoning; antidotes; community pharmacists; knowledge attitudes practices; naloxone; Pakistan; pharmacy preparedness.

INTRODUCTION

Acute poisoning remains a preventable but time-sensitive public health emergency, characterized by the rapid onset of toxic effects after exposure to harmful substances such as pesticides, pharmaceutical drugs, household chemicals, industrial agents, and environmental toxins (1,2). The burden is particularly pronounced in low- and middle-income countries, where hazardous substances may be easily accessible, regulatory controls may be limited, and emergency response systems may be unevenly distributed across urban and peri-urban settings (2,3). Globally, millions of poisoning events are estimated to occur each year, with a substantial proportion progressing to severe toxicity or death, and the mortality burden is disproportionately concentrated in resource-limited regions, including parts of the Eastern Mediterranean and South-East Asia (3–5). In these settings, poisoning outcomes are influenced not only by the nature and dose of the toxic exposure but also by the timeliness of recognition, availability of appropriate antidotes, and preparedness of frontline healthcare personnel.

Pakistan faces a clinically important poisoning burden, with hospital-based reports identifying organophosphate pesticides, benzodiazepines, opioids, paracetamol, household chemicals, and other pharmaceutical agents among common causes of acute toxic exposure (6–9). In large urban centers such as Lahore, the risk is amplified by dense populations, widespread access to prescription and non-prescription medicines, agricultural chemical availability in surrounding regions, and variable pathways through which patients seek urgent care. Although tertiary care hospitals manage severe poisoning cases, many individuals initially approach community pharmacies for immediate advice, symptomatic relief, referral guidance, or access to medicines. Community pharmacists therefore occupy a strategically important position in poisoning prevention and early response, particularly because they are often among the most accessible healthcare professionals for the public (16,17).

Antidotes are a critical component of poisoning management because they counteract or reduce the toxic effects of specific agents when administered appropriately and promptly (10,11). International recommendations emphasize that healthcare facilities involved in emergency care should maintain essential antidotes in quantities sufficient for initial management, and the same principle is increasingly relevant to community-level systems where pharmacies may serve as early contact points before hospital transfer (12). However, evidence from several countries indicates that antidote availability is frequently inadequate outside major hospital settings, especially in community pharmacies and resource-constrained health systems (13–15). This gap can delay emergency management, increase preventable morbidity, and weaken continuity between first-contact care and referral-based toxicology services.

The professional role of community pharmacists in poisoning-related care extends beyond dispensing. Pharmacists can contribute to overdose prevention, medication counselling, safe storage education, early recognition of poisoning syndromes, timely referral, and coordination with emergency or poison control services (17–19). However, this potential depends on whether pharmacies stock relevant antidotes and whether pharmacists possess sufficient knowledge and confidence to recognize common poisoning presentations and initiate appropriate first-line actions. Studies from comparable settings have shown a consistent pattern of poor antidote availability and limited pharmacist knowledge regarding poisoning management. In Ethiopia, substantial gaps were reported in both antidote availability and pharmacist knowledge in community pharmacies (20). In Pretoria, South Africa, a large proportion of pharmacies stocked no antidotes, while studies from Malaysia and Punjab, Pakistan, also documented important shortages and preparedness gaps in institutional settings (21–23). Collectively, these findings indicate that antidote preparedness is not only a supply issue but also a systems, training, and role-definition issue.

Despite this international and regional evidence, community pharmacy preparedness for acute poisoning has not been adequately evaluated in Lahore, one of Pakistan's largest and most densely populated cities. Existing Pakistani data largely focus on hospital presentations or institutional antidote availability rather than the community pharmacy sector, where patients may initially seek advice and where preventive counselling could reduce poisoning risk (6,7,23). This creates an important knowledge gap: it remains unclear whether community pharmacies in Lahore maintain essential antidotes, whether pharmacists can correctly identify antidotes for common poisoning syndromes, and whether their attitudes and practices support integration into emergency response pathways. Addressing this gap is essential for informing pharmacy regulation, continuing professional development, antidote stocking policies, and potential collaboration with poison control centers.

The present study was therefore designed as a cross-sectional assessment of community pharmacists in Lahore, Pakistan, using a knowledge, attitudes, and practices framework. The study aimed to determine the availability of selected essential antidotes in community pharmacies, assess pharmacists' knowledge of antidotes for clinically relevant poisoning syndromes, evaluate attitudes toward their professional role and further training, and describe current practices related to counselling, poisoning recognition, and first-line emergency response. The central research question was whether community pharmacies and pharmacists in Lahore demonstrate adequate preparedness to support early management of acute poisoning through antidote availability, knowledge, and emergency-response practices.

MATERIALS AND METHODS

This study used a cross-sectional observational survey design to assess antidote availability and community pharmacist preparedness for acute poisoning management in Lahore, Punjab, Pakistan. The design was selected because the objective was to estimate the current level of antidote stocking, knowledge, attitudes, and self-reported practices among practicing community pharmacists at a defined point in time. Lahore was considered an appropriate setting because it is Pakistan's second-largest city, has a large and densely distributed community pharmacy network, and serves populations with diverse patterns of medicine access and potential toxic exposure. The target population comprised licensed community pharmacists actively working in community pharmacies in Lahore during the period of data collection. One pharmacist was recruited from each participating pharmacy to avoid duplicate pharmacy-level responses and to maintain independence of observations.

Participants were eligible if they were licensed pharmacists working in a community pharmacy in Lahore and were available during the data collection visit. Pharmacists who were unavailable at the time of data collection or declined participation were not included. A convenience sampling strategy was used, and recruitment continued until 102 completed questionnaires were obtained. Written informed consent was obtained from all participants before data collection. Participation was voluntary, and respondents were informed that they could refuse or withdraw without penalty. Responses were collected anonymously to reduce social desirability bias and protect participant confidentiality.

The sample size was calculated using Cochran's formula for large populations, applying a 95% confidence level and a 10% margin of error, which produced a minimum required sample size of 97 participants. The final sample included 102 pharmacists, exceeding the minimum requirement. Although convenience sampling may limit external generalizability, the study attempted to improve internal consistency by using the same structured questionnaire across participants, recruiting only one pharmacist per pharmacy, and applying predefined operational definitions for key outcomes.

Data were collected using a self-administered structured questionnaire developed by the study team after reviewing instruments and variables used in comparable studies on antidote availability and pharmacist preparedness (20,21,23,24). The questionnaire was pilot-tested before deployment and refined for clarity, comprehension, and practical administration. The final instrument included items on demographic and professional characteristics, antidote availability, knowledge of antidotes for common poisoning syndromes, attitudes toward pharmacist roles and training, perceived barriers to antidote stocking, and emergency management practices. Demographic variables included age, gender, qualification, years of professional experience, and number of pharmacists working in the facility.

Antidote availability was assessed by asking respondents whether each of 19 selected antidotes was available in their pharmacy at the time of survey completion. Availability was operationally categorized at the pharmacy level as good when 12 or more of the 19 antidotes were stocked and poor when fewer than 12 antidotes were stocked, consistent with thresholds used in prior related work and aligned with the concept of essential antidote preparedness (20,25). Item-level availability was summarized as the number and percentage of pharmacies stocking each antidote. Reasons for not stocking antidotes were assessed using multiple-response options, including perceived low demand, financial constraints, non-ordering, supply non-delivery, and expired unused stock.

Knowledge was assessed using five open-ended clinical poisoning scenarios requiring respondents to identify the most appropriate antidote for opioid poisoning, alcohol toxicity, benzodiazepine overdose, paracetamol toxicity, and organophosphate or pesticide poisoning. Each correct response was scored as one point and each incorrect response as zero. The total knowledge score ranged from 0 to 5. Knowledge was categorized as good when the respondent correctly identified at least three of the five antidotes and poor when fewer than three responses were correct. This threshold was selected to distinguish pharmacists demonstrating minimum practical recognition across multiple clinically relevant poisoning syndromes from those with insufficient antidote identification capacity.

Attitudes were assessed using five-point Likert-scale items ranging from strongly agree to strongly disagree. Items addressed perceived pharmacist role in poisoning management and perceived importance of ongoing training. Policy-related attitudes included support for mandatory antidote stocking and willingness to collaborate with poison control centers. Perceived barriers to antidote stocking were assessed using multiple-response items, including low demand, lack of training, high cost, regulatory issues, and supply chain difficulties. Practice-related variables included prior formal training in poisoning management, frequency of dosage counselling to prevent overdose, counselling about safe medication storage for children, perceived ability to identify poisoning type from patient symptoms, prior encounter with an acute poisoning case in the pharmacy and intended first action if a poisoned patient presented.

Data were entered and analyzed using IBM SPSS Statistics version 26.0. Descriptive statistics were used to summarize all study variables. Categorical variables were reported as frequencies and percentages, while continuous or scale-based variables were summarized using appropriate measures of central tendency and dispersion, including means, medians, modes, and standard deviations where applicable. Antidote availability, knowledge category, attitude responses, policy responses, and practice variables were analyzed as categorical outcomes. Chi-square tests of independence were used to assess associations between categorical variables, including the relationship between years of professional experience and antidote knowledge category. A p-value of less than 0.05 was considered statistically significant, and analyses were interpreted using a 95% confidence level.

Missing data were handled using valid-case analysis for the affected variable. One respondent had missing data for the knowledge assessment; therefore, knowledge-related analyses were conducted using 101 valid responses, while other analyses were based on the full sample of 102 respondents. No imputation was performed because the amount of missing data was minimal and confined to the knowledge outcome. To support data integrity, completed questionnaires were reviewed for completeness before entry, variables were coded using predefined categories, and analysis was conducted according to the stated operational definitions. Potential sources of bias included convenience sampling, self-reported practices, and possible social desirability in attitude and counselling responses; these were addressed through anonymous participation, standardized questionnaire administration, and objective scoring of open-ended knowledge items.

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants before data collection, participation was voluntary, and all responses were anonymized before analysis. No individually identifiable participant data, images, or personal information were reported. De-identified study data may be made available by the corresponding author upon reasonable request, subject to institutional data governance requirements.

RESULTS

A total of 102 community pharmacists from Lahore completed the survey. Most respondents were male (66.7%), and the largest age category was 26–35 years (63.7%). Professional experience was distributed across early and mid-career categories, with 35.3% reporting 3–5 years of experience and 28.4% reporting 6–10 years. Most pharmacies had either one pharmacist (44.1%) or two to three pharmacists (53.9%) working at the facility. The demographic and professional profile of respondents is shown in Table 1.

Table 1. Sociodemographic and Professional Characteristics of Community Pharmacists (N = 102)

Characteristic	Category	n	%
Gender	Male	68	66.7
	Female	34	33.3
Age group	<25 years	12	11.8
	26–35 years	65	63.7
	36–45 years	23	22.5
	46–55 years	2	2.0
Professional experience	<2 years	22	21.6
	3–5 years	36	35.3
	6–10 years	29	28.4
	>10 years	15	14.7
Pharmacists per facility	1 pharmacist	45	44.1
	2–3 pharmacists	55	53.9
	≥4 pharmacists	2	2.0

Note. Percentages may not total exactly 100.0 due to rounding. No inferential comparison was performed for Table 1 because the table is descriptive.

Antidote availability was poor across all surveyed pharmacies. None of the 102 pharmacies stocked 12 or more of the 19 selected antidotes; therefore, 100.0% were classified as having poor overall antidote availability. Sodium bicarbonate was the most frequently available antidote, stocked by 58 pharmacies (56.9%; 95% CI: 47.2–66.1), followed by activated charcoal (45.1%; 95% CI: 35.8–54.8), acetylcysteine (44.1%; 95% CI: 34.9–53.8), citric acid (38.2%), and atropine (36.3%; 95% CI: 27.6–45.9). Availability of emergency antidotes for opioid and benzodiazepine poisoning was particularly low, with naloxone stocked in only 16.7% of pharmacies and flumazenil in 21.6%. Four antidotes—ipecacuanha, dicobalt edetate, disulfiram, and mesna/obidoxime—were not available in any surveyed pharmacy.

Table 2. Availability of 19 Essential Antidotes Across Community Pharmacies in Lahore (N = 102)

Antidote	Available n	Available %	95% CI for Availability	Availability Level
Sodium bicarbonate	58	56.9	47.2–66.1	Moderate
Activated charcoal	46	45.1	35.8–54.8	Low
Acetylcysteine / N-acetylcysteine	45	44.1	34.9–53.8	Low
Citric acid	39	38.2	29.4–47.9	Low
Atropine	37	36.3	27.6–45.9	Low
Flumazenil	22	21.6	14.7–30.5	Low
Naloxone	17	16.7	10.7–25.1	Very low
Sodium nitrite	15	14.7	9.1–22.9	Very low
Sodium polystyrene sulfonate	4	3.9	1.5–9.7	Very low
Sodium thiosulphate	4	3.9	1.5–9.7	Very low
Deferoxamine	2	2.0	0.5–6.9	Very low
Methionine	2	2.0	0.5–6.9	Very low
Folinic acid	1	1.0	0.2–5.3	Very low
Methylene blue	1	1.0	0.2–5.3	Very low
Dimercaprol / BAL	1	1.0	0.2–5.3	Very low
Ipecacuanha	0	0.0	0.0–3.6	Absent
Dicobalt edetate	0	0.0	0.0–3.6	Absent
Disulfiram	0	0.0	0.0–3.6	Absent
Mesna / obidoxime	0	0.0	0.0–3.6	Absent
Overall poor availability category	102	100.0	96.4–100.0	Poor

Note. Availability level classification: absent = 0%; very low = <20%; low = 20–49%; moderate = 50–74%. Overall availability was categorized as poor when fewer than 12 of 19 antidotes were stocked. Confidence intervals are Wilson 95% confidence intervals.

The most frequently reported reason for not stocking antidotes was perceived low demand or proximity to hospitals, reported by 83 pharmacists (81.4%). Financial constraints or high cost were reported by 27 respondents (26.5%), while supply non-delivery and non-ordering were each reported by 4.9%. Expired unused stock was reported by 2.9%. These findings suggest that antidote non-availability was driven mainly by perceived lack of demand rather than documented supply chain failure.

Table 3. Reported Reasons for Not Stocking Antidotes (N = 102; Multiple Responses Permitted)

Reason Cited	n	% of Respondents	95% CI
Low demand / pharmacy near hospital	83	81.4	72.8–88.0
Financial constraints / too expensive	27	26.5	18.9–35.8
Stock ordered but not delivered	5	4.9	2.1–10.9
Stock not ordered	5	4.9	2.1–10.9
Expired unused stock	3	2.9	1.0–8.3

Multiple responses were permitted; therefore, percentages exceed 100% cumulatively. No inferential comparison was performed because responses were not mutually exclusive.

Knowledge assessment was completed by 101 respondents because one knowledge response was missing. Overall, 81 respondents (80.2%; 95% CI: 71.4–86.8) had poor antidote knowledge, while only 20 respondents (19.8%; 95% CI: 13.2–28.6) met the threshold for good knowledge. Correct antidote identification was highest for opioid poisoning (37.3%), followed by benzodiazepine overdose (33.3%) and paracetamol toxicity (30.4%). Correct identification was lower for organophosphate or pesticide poisoning (24.8%) and lowest for alcohol toxicity (8.8%), indicating substantial knowledge gaps across all five clinically relevant poisoning syndromes.

Table 4. Pharmacists' Knowledge of Antidotes for Common Poisoning Syndromes (N = 101 Valid Knowledge Responses)

Poisoning Syndrome	Correct n	Correct %	95% CI for Correct Response	Incorrect n	Incorrect %
Opioid poisoning	38	37.3	28.5–47.0	64	62.7
Benzodiazepine overdose	34	33.3	25.0–42.9	68	66.7
Paracetamol / acetaminophen toxicity	31	30.4	22.3–39.9	71	69.6
Organophosphate / pesticide poisoning	25	24.8	17.4–34.0	76	75.2
Alcohol toxicity	9	8.8	4.7–15.9	93	91.2
Overall poor knowledge	81	80.2	71.4–86.8	—	—
Overall good knowledge	20	19.8	13.2–28.6	—	—

Note. Knowledge was categorized as good when ≥3 of 5 antidotes were correctly identified and poor when <3 were correctly identified. One respondent had missing knowledge data.

The association between professional experience and knowledge category is shown in Table 5. Good knowledge was present in 19.0% of pharmacists with less than two years of experience, 16.7% with 3–5 years, 20.7% with 6–10 years, and 26.7% with more than 10 years of experience. Although the proportion of good knowledge was numerically highest among pharmacists with more than 10 years of experience, this association was not statistically significant (Pearson $\chi^2 = 0.690$, df = 3, $p = 0.876$). Compared with pharmacists with less than two years of experience, the odds of good knowledge were not significantly higher in any experience category.

Table 5. Association Between Professional Experience and Antidote Knowledge Category (N = 101)

Experience Category	Poor Knowledge n (%)	Good Knowledge n (%)	Total n	Odds Ratio for Good Knowledge*	95% CI	p-value
<2 years	17 (81.0)	4 (19.0)	21	Reference	—	—
3–5 years	30 (83.3)	6 (16.7)	36	0.85	0.21–3.44	—
6–10 years	23 (79.3)	6 (20.7)	29	1.11	0.27–4.55	—
>10 years	11 (73.3)	4 (26.7)	15	1.55	0.32–7.50	—
Overall association	81 (80.2)	20 (19.8)	101	—	—	0.876

*Note. Pearson chi-square = 0.690, df = 3, p = 0.876. *Odds ratios compare each experience category with the <2 years reference group. Confidence intervals were derived from the aggregated 2×2 comparisons and should be interpreted cautiously because subgroup counts were small.*

Attitude responses showed a divergence between role perception and training demand. Only 36.3% of pharmacists agreed or strongly agreed that pharmacists play a crucial role in poisoning management, while 34.3% were neutral and 29.4% disagreed or strongly disagreed. In contrast, 87.2% agreed or strongly agreed that ongoing training in poisoning management is important. The mean attitude score for pharmacist role was 2.90 ± 1.45, indicating mixed views, whereas the mean score for training importance was 1.38 ± 0.86, indicating strong agreement.

Table 6. Attitudes Toward Pharmacist Role and Training Importance (N = 102)

Statement	Response	n	%	Mean ± SD
Pharmacists play a crucial role in poisoning management	Strongly agree	26	25.5	2.90 ± 1.45
	Agree	11	10.8	
	Neutral	35	34.3	
	Disagree	7	6.9	
	Strongly disagree	23	22.5	
Ongoing training on poisoning management is important	Strongly agree	81	79.4	1.38 ± 0.86
	Agree	8	7.8	
	Neutral	10	9.8	
	Disagree / strongly disagree	3	3.0	

Note. Lower mean scores indicate stronger agreement on the five-point Likert scale. No inferential comparison was performed between attitude items because the manuscript did not report paired statistical testing.

Policy attitudes and perceived barriers are shown in Table 7. Most pharmacists supported collaboration between community pharmacies and poison control centers (90.2%; 95% CI: 82.9–94.6). However, support for mandatory antidote stocking was limited: 36.3% supported mandatory stocking, 54.9% opposed it, and 8.8% were unsure. The leading perceived barrier to stocking antidotes was low demand (77.5%), followed by lack of training (21.6%), high cost (18.6%), regulatory issues (5.9%), and supply chain difficulties (2.0%). This pattern suggests that pharmacists were receptive to system-level collaboration but hesitant toward mandatory inventory requirements, likely because of perceived demand and cost concerns.

Table 7. Policy Attitudes and Barriers to Antidote Stocking (N = 102)

Policy / Barrier Item	Response / Category	n	%	95% CI
Mandatory antidote stocking policy	Yes	37	36.3	27.6–45.9
	No	56	54.9	45.2–64.2
	Unsure	9	8.8	4.7–15.9
Collaborate with poison control centers	Yes	92	90.2	82.9–94.6
	No	5	4.9	2.1–10.9
	Unsure	5	4.9	2.1–10.9
Barrier to stocking	Low demand	79	77.5	68.5–84.5
	Lack of training	22	21.6	14.7–30.5
	High cost	19	18.6	12.3–27.3
	Regulatory issues	6	5.9	2.7–12.2
	Supply chain issues	2	2.0	0.5–6.9

Note. Barrier items allowed multiple responses; therefore, cumulative percentages exceed 100%.

Practice-related findings are presented in Table 8. Only 21 pharmacists (20.6%; 95% CI: 13.9–29.4) had received formal training in poisoning management, whereas 81 (79.4%) had not. Despite limited training, preventive counselling practices were commonly reported: 59.8% always counselled patients about dosage to avoid overdose, and 84.3% always advised keeping medicines out of children's reach. However, only 14.7% reported that they could identify poisoning type from patient symptoms, while 72.5% stated that they could not. Nearly one-third of pharmacists (31.4%) had previously encountered an acute poisoning case in their pharmacy. If a poisoned patient presented, 58.8% reported that their first action would be calling emergency services and 41.2% reported referral to hospital. Formal training was not significantly associated with dosage counselling (p = 0.208) or child safety counselling (p = 0.843).

Table 8. Poisoning Management Practices of Community Pharmacists (N = 102)

Practice Item	Response	n	%	95% CI	p-value
Received formal training on poisoning management	Yes	21	20.6	13.9–29.4	
	No	81	79.4	70.6–86.1	
Dosage counselling to prevent overdose	Always	61	59.8	50.1–68.8	0.208*

Practice Item	Response	n	%	95% CI	p-value
	Sometimes	39	38.2	29.4–47.9	
	Never	2	2.0	0.5–6.9	
Child safety counselling	Always	86	84.3	76.0–90.2	0.843†
	Sometimes	16	15.7	9.8–24.0	
Can identify poisoning type from symptoms	Yes	15	14.7	9.1–22.9	
	No	74	72.5	63.2–80.2	
	Unsure	13	12.7	7.6–20.6	
Ever encountered acute poisoning case in pharmacy	Yes	32	31.4	23.2–40.9	
	No	70	68.6	59.1–76.8	
First action if poisoned patient presents	Call emergency services	60	58.8	49.1–67.9	
	Refer to hospital	42	41.2	32.1–50.9	

*Note. *p-value for association between formal training and dosage counselling. †p-value for association between formal training and child safety counselling. Effect sizes could not be calculated for these associations because the manuscript did not provide the underlying cross-tabulated cell counts.*

The derived preparedness gradient is shown in Figure 1. The figure integrates major deficit indicators across availability, knowledge, training, symptom recognition, policy attitudes, and prior poisoning exposure. The steepest deficit was poor antidote availability, affecting all surveyed pharmacies (100.0%; 102/102), followed by poor antidote knowledge (80.2%; 81/101), absence of formal poisoning training (79.4%; 81/102), and inability to identify poisoning type from symptoms (72.5%; 74/102). More than half of respondents opposed mandatory antidote stocking (54.9%; 56/102), while 31.4% had previously encountered an acute poisoning case in pharmacy practice. This pattern demonstrates a clinically important mismatch: poisoning cases are encountered in community pharmacy settings, yet the structural, educational, and diagnostic preparedness needed for early poisoning response remains substantially deficient.

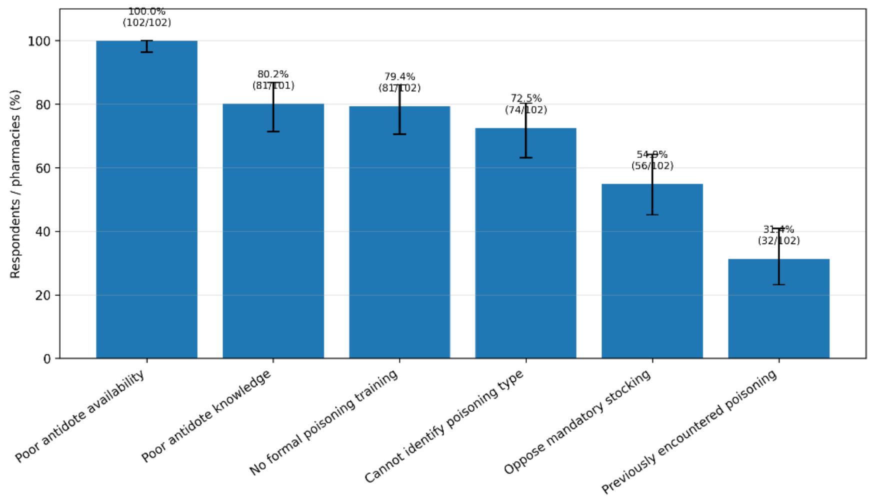

Figure 1 Preparedness Deficit Gradient for Acute Poisoning Response in Community Pharmacies

The preparedness deficit gradient shows that the largest system-level gap was antidote availability, with 100.0% of pharmacies classified as poorly stocked. Knowledge and training deficits were nearly parallel, with 80.2% of pharmacists demonstrating poor antidote knowledge and 79.4% reporting no formal poisoning-management training. Symptom-based recognition was also limited, as 72.5% of respondents stated that they could not identify poisoning type from clinical presentation. Although 31.4% had previously encountered an acute poisoning case in the pharmacy, more than half opposed mandatory antidote stocking, highlighting a disconnect between clinical exposure, perceived responsibility, and preparedness infrastructure.

DISCUSSION

This cross-sectional study demonstrates substantial gaps in acute poisoning preparedness among community pharmacies in Lahore, with all surveyed pharmacies classified as having poor antidote availability and most pharmacists demonstrating inadequate antidote knowledge. The most clinically important finding was that no pharmacy stocked 12 or more of the 19 selected antidotes, indicating that the community pharmacy sector in the surveyed setting is not currently positioned to provide meaningful antidote-based first-contact support during poisoning emergencies. This finding is particularly concerning because acute poisoning requires rapid recognition and timely access to appropriate pharmacological countermeasures, and delays in antidote administration may contribute to preventable morbidity and mortality (10–12). Although tertiary hospitals remain the primary sites for definitive management, community pharmacies often serve as accessible first-contact health facilities in Pakistan, especially in densely populated urban areas where patients may initially seek urgent advice, referral guidance, or emergency medicines (16,17).

The availability pattern showed that only sodium bicarbonate reached a moderate level of stocking, while most antidotes were available at low or very low levels. The limited availability of naloxone is especially important because opioid toxicity is a recognized contributor to poisoning-related emergency presentations and is increasingly relevant in the context of opioid-use burden in Pakistan (8,27,28). Naloxone is widely regarded as a life-saving intervention for opioid overdose, and community-level access has been associated with reduced opioid overdose mortality in several public health models (29,30). Similarly, atropine was available in only around one-third of pharmacies, despite its central role in the management of organophosphate poisoning, a major toxicological concern in agricultural and LMIC contexts (31,32). The absence of several antidotes across all surveyed pharmacies further indicates that the issue is not limited to isolated supply shortages but reflects a broader absence of antidote preparedness within routine pharmacy inventory systems.

The most frequently reported reason for not stocking antidotes was perceived low demand, followed by financial constraints. This pattern suggests that stocking behavior is shaped by commercial turnover expectations rather than emergency preparedness needs. Similar findings have been reported in community and hospital pharmacy studies from comparable settings, where antidote non-availability was often linked to low perceived demand, procurement limitations, lack of institutional requirements, and concerns regarding expiry of rarely used products (20–23). In the Lahore context, perceived low demand may create a self-reinforcing cycle: pharmacies do not stock antidotes because poisoning cases are considered uncommon, but the absence of antidotes further limits the role of pharmacists in poisoning response, thereby reducing the likelihood that pharmacies are recognized by the public or health system as emergency support points. This cycle cannot be resolved by individual pharmacist motivation alone and requires policy, procurement, and training mechanisms that define which antidotes should be stocked at different levels of care.

The knowledge findings reinforce the structural availability problem. More than four-fifths of respondents had poor antidote knowledge, and correct identification was low for every poisoning syndrome assessed. Knowledge was highest for opioid poisoning but still remained below 40%, while correct identification for alcohol toxicity was below 10%. This pattern indicates that even when poisoning syndromes are clinically important, many pharmacists may not be sufficiently prepared to identify the appropriate antidote. Comparable studies from Ethiopia and other LMIC settings have reported similarly low knowledge levels among pharmacists, suggesting that this is a recurring limitation in pharmacy-based toxicology preparedness rather than a setting-specific anomaly (20,33,34). The low correct response rate for organophosphate poisoning is particularly important in Pakistan because pesticide exposure remains clinically relevant, and inadequate recognition of atropine as a key antidote could delay appropriate emergency referral or first-line advice (6,7,31).

Professional experience was not significantly associated with antidote knowledge, indicating that longer practice duration alone does not ensure toxicology competence. This finding has practical importance because it challenges the assumption that pharmacists naturally acquire poisoning-management skills through routine practice. Poisoning cases may occur infrequently, and when they do occur, pharmacists may primarily refer patients rather than directly participate in assessment or antidote selection. Therefore, experiential learning in this area may be insufficient unless pharmacists are systematically exposed to structured continuing professional development, simulation-based emergency training, poison information resources, and clear referral algorithms. The absence of a significant association between experience and knowledge also supports the need for training interventions across all professional experience levels rather than only targeting newly graduated pharmacists.

The attitude findings reveal an important role-definition gap. While most pharmacists strongly supported ongoing training and collaboration with poison control centers, only about one-third agreed that pharmacists play a crucial role in poisoning management. This divergence suggests that pharmacists recognize the importance of additional competence but may not clearly perceive their own professional role within poisoning-response pathways. Similar role ambiguity has been reported in other pharmacy settings, where pharmacists may support emergency preparedness in principle but remain uncertain about clinical responsibilities, legal authority, stocking expectations, and referral boundaries (22,37). In Lahore, this ambiguity may be intensified by the lack of formal poison control integration and the absence of mandatory community-level stocking requirements. The high level of support for poison control center collaboration is therefore a positive and actionable finding, as it indicates readiness for structured linkage rather than resistance to system-level involvement.

The practice findings show a mixed pattern. Preventive counselling practices were relatively common, particularly advice on safe medicine storage for children and dosage counselling to prevent overdose. However, only a small minority of pharmacists reported that they could identify poisoning type from symptoms. This discrepancy suggests that pharmacists are more comfortable with preventive medication-safety counselling than with clinical toxicology recognition. The fact that nearly one-third of respondents had previously encountered an acute poisoning case in pharmacy practice confirms that poisoning is not merely a theoretical concern in community pharmacy settings. However, the dominant planned actions—calling emergency services or referring to hospital—indicate that current practice is primarily referral-oriented. Referral is appropriate and often necessary, but its effectiveness can be strengthened if pharmacists are trained to recognize red flags, provide safe first-contact guidance, avoid harmful interventions, identify when antidotes may be urgently required, and coordinate rapidly with emergency services.

The policy implications of these findings are considerable. Mandatory universal stocking of all antidotes in every community pharmacy may not be financially realistic, particularly for rarely used agents with expiry concerns. However, the complete absence of good availability suggests that a tiered preparedness model may be more appropriate. Such a model could classify antidotes into essential community-level agents, referral-center agents, and hospital-only agents based on urgency, stability, cost, local poisoning patterns, and feasibility of safe use. Community pharmacies could be required or incentivized to stock a minimum emergency set—such as activated charcoal where appropriate, naloxone, atropine access pathways, and other locally prioritized agents—while maintaining formal referral and supply-chain links with nearby hospitals and poison control services. Subsidized procurement, pooled inventory systems, expiry replacement mechanisms, and digital stock mapping could reduce financial disincentives and improve emergency access.

The study has several limitations that should be considered when interpreting the findings. The cross-sectional design prevents causal inference and captures preparedness at only one point in time. Convenience sampling limits generalizability beyond the surveyed pharmacies and may not fully represent all community pharmacy types in Lahore. The study relied partly on self-reported responses, which may introduce recall or social desirability bias, particularly for counselling and practice items. Antidote availability was assessed as present or absent and did not include verification of stock quantity, expiry status, storage conditions, or immediate accessibility. The knowledge score used five selected poisoning scenarios and therefore may not capture the full range of toxicology competence. Finally, inferential analysis was limited by the available aggregated data and the small number of respondents with good knowledge, restricting more detailed multivariable modelling.

Despite these limitations, the study provides important baseline evidence on a neglected component of Pakistan's emergency preparedness system. The findings show that antidote availability, pharmacist knowledge, formal training, and symptom-recognition confidence are all insufficient for effective community-level poisoning response. Future research should use probability-based sampling across multiple cities, verify physical stock and expiry status, evaluate pharmacy ownership and location factors, and test targeted interventions such as pharmacist training modules, poison center linkage, and minimum antidote stocking frameworks. From a public health perspective, the data support the need to move beyond individual-level awareness and toward an integrated preparedness model involving regulators, pharmacy councils, poison information services, emergency departments, and community pharmacies.

CONCLUSION

Community pharmacies in Lahore demonstrated critically inadequate preparedness for acute poisoning management, with all surveyed pharmacies falling below the predefined threshold for good antidote availability and most pharmacists showing poor antidote knowledge. Formal training in poisoning management was uncommon, symptom-based poisoning recognition was limited, and professional role perception remained inconsistent despite strong support for further training and collaboration with poison control centers. These findings indicate that the current community pharmacy system is not sufficiently equipped to support early poisoning response beyond referral. Strengthening preparedness will require a coordinated strategy that includes minimum antidote stocking standards, structured continuing professional development, practical poisoning-recognition algorithms, and formal integration of community pharmacies with emergency and poison control networks.

REFERENCES

1. Malangu N, Ogunbanjo GA. A profile of acute poisoning at selected hospitals in South Africa. S Afr J Epidemiol Infect. 2009;24(2):14-16.

2. Chowdhary A, Banerjee S, Brahma A, Biswas M. Pesticide poisoning in nonfatal, deliberate self-harm: a public health issue. Indian J Psychiatry. 2007;49(2):117-121.

3. World Health Organization. Safer access to pesticides: community interventions. Geneva: World Health Organization; 2006.

4. Moazzam M, Al Saigul AM, Naguib M, Al Alfi MA. Pattern of acute poisoning in Al-Qassim region: a surveillance report from Saudi Arabia, 1999–2003. East Mediterr Health J. 2009;15(4):1005-1010.

5. Thanacoody R, Caravati EM, Troutman B, et al. Position paper update: whole bowel irrigation for gastrointestinal decontamination of overdose patients. Clin Toxicol. 2015;53(1):5-12.

6. Raza SA, Bhatt SN, Nawaz A, et al. Clinical profile and outcome of acute poisoning cases presenting to an emergency department of a tertiary care hospital in Karachi, Pakistan. J Pak Med Assoc. 2018;68(4):562-567.

7. Ali G, Siddiqui MI, Rashid A. Pattern of acute poisoning presenting to emergency department: a study from a tertiary care hospital in Lahore. Ann King Edward Med Univ. 2019;25(1):1-6.

8. Mir MU, Khan I, Ahmed B, Raza SA. Opioid use in Pakistan: trends, burdens, and policy implications. Subst Abuse Treat Prev Policy. 2020;15(1):46.

9. Daly FFS, Little M, Murray L. A risk assessment based approach to the management of acute poisoning. Emerg Med J. 2006;23(5):396-399.

10. Woolf AD, Chrisanthus K. On-site availability of selected antidotes: results of a survey of Massachusetts hospitals. Am J Emerg Med. 1997;15(1):62-66.

11. Luisetto M, Ghulam Rasool B. Emergency antidote management and global distribution. J Appl Pharm. 2016;8(3):1-6.

12. Dart RC, Borron SW, Caravati EM, et al. Expert consensus guidelines for stocking of antidotes in hospitals that provide emergency care. Ann Emerg Med. 2009;54(3):386-394.

13. Sohn CH, Ryoo SM, Lim KS, Kim W, Lim H, Oh BJ. Kind and estimated stocking amount of antidotes for initial treatment of acute poisoning at emergency medical centres in Korea. J Korean Med Sci. 2014;29(11):1562-1571.

14. Abbott V, Creighton M, Hannam J, Vincent T, Coulter C. Access in New Zealand to antidotes for accidental and intentional drug poisonings. J Prim Health Care. 2012;4(2):100-105.

15. Betten DP, Vohra RB, Cook MD, Matteucci MJ, Clark RF. Antidote use in the critically ill poisoned patient. J Intensive Care Med. 2006;21(5):255-277.

16. Khan MU, Ahmad A, Salman S, et al. Public preferences and awareness regarding community pharmacy services in a Pakistani province. Int J Pharm Pract. 2016;24(3):230-238.

17. Nacopoulos AG, Lewtas AJ, Ousterhout MM. Syringe exchange programs: impact on injection drug users and the role of the pharmacist from a US perspective. J Am Pharm Assoc. 2010;50(2):148-157.

18. Kinnard WJ. The role of the pharmacist in the control of acute poisoning. London: Taylor & Francis; 1971.

19. Sharma A, Pandit V. Importance of poison information centre and role of a pharmacist in management of poisoning. Int J Pharm Teach Pract. 2014;5(1):905-909.

20. Kifle ZD, Yimenu DK, Demeke CA, et al. Availability of essential antidotes and the role of community pharmacists in the management of acute poisoning: a cross-sectional study in Ethiopia. INQUIRY. 2022;59:1-11.

21. Malangu N. Availability of selected antidotes in community pharmacies in Pretoria. S Afr J Epidemiol Infect. 2006;21(4):170-172.

22. Al-Sohaim SI, Awang R, Zyoud SH, Rashid SM, Hashim S. Evaluate the impact of hospital types on the availability of antidotes for the management of acute toxic exposures and poisonings in Malaysia. Hum Exp Toxicol. 2012;31(3):274-281.

23. Arslan N, Khiljee S, Bakhsh A, Ashraf M, Maqsood I. Availability of antidotes and key emergency drugs in tertiary care hospitals of Punjab and assessment of the knowledge of health care professionals in the management of poisoning cases. Pak J Pharm Sci. 2016;29(2):603-607.

24. Abd-Elhaleem ZA, Al Muqhem B. Pattern of acute poisoning in Al Majmaah region, Saudi Arabia. Am J Clin Exp Med. 2014;4(2):79-85.

25. World Health Organization. Model list of essential medicines. 23rd ed. Geneva: World Health Organization; 2023.

26. Sohn CH, Ryoo SM, Kim WY, et al. Analysis of antidote availability at emergency medical centers in Korea. Clin Toxicol. 2014;52(4):252-257.

27. United Nations Office on Drugs and Crime. World drug report 2023: Pakistan country profile. Vienna: United Nations Office on Drugs and Crime; 2023.

28. Kakar A, Khan AG, Mian BI. Burden of opioid use disorder in Pakistan: a public health perspective. J Pak Psychiatr Soc. 2021;18(2):28-33.

29. Wheeler E, Jones TS, Gilbert MK, Davidson PJ. Opioid overdose prevention programs providing naloxone to laypersons — United States, 2014. MMWR Morb Mortal Wkly Rep. 2015;64(23):631-635.

30. Coffin PO, Sullivan SD. Cost-effectiveness of distributing naloxone to heroin users for lay overdose reversal. Ann Intern Med. 2013;158(1):1-9.

31. Chelkeba L, Mulatu A, Feyissa D, Bekele F, Tesfaye BT. Patterns and epidemiology of acute poisoning in Ethiopia: systematic review of observational studies. Arch Public Health. 2018;76(1):34.

32. Desalew M, Aklilu A, Amanuel A, Addisu M. Pattern of acute adult poisoning at Tikur Anbessa specialized teaching hospital: a retrospective study, Ethiopia. Hum Exp Toxicol. 2011;30(7):523-527.

33. Mwagomba BLM, Mang'ombe C, Dzingwa N. Assessment of antidote availability and pharmacist knowledge of poisoning management in selected hospitals in Malawi. Malawi Med J. 2019;31(4):261-267.

34. Oshikoya KA, Oreagba IA, Adeyemi OO. Sources of drug information and their influence on drug prescribing practice of doctors in Lagos, Nigeria. Pan Afr Med J. 2011;9:14.

35. Teklemariam E, Tesema S, Jemal A. Pattern of acute poisoning in Jimma University Specialized Hospital, Southwest Ethiopia. World J Emerg Med. 2016;7(4):290-294.

36. Joubert P, Grossman E. Knowledge of community pharmacists regarding poisoning emergencies in South Africa. J Clin Pharm Ther. 2018;43(5):712-719.

37. Abbott V, Creighton M, Hannam J, Vincent T, Coulter C. Perceptions of community pharmacists in New Zealand regarding their role in poisoning management. Pharm Pract. 2014;12(3):414.

38. Woolf AD, Erdman AR, Nelson LS, et al. Tricyclic antidepressant poisoning: an evidence-based consensus guideline for out-of-hospital management. Clin Toxicol. 2007;45(3):203-233.

39. Bakhit MSA, Mohammed MY, Hussain MS, et al. Assessment of pharmacists' knowledge about poisoning management in Khartoum, Sudan. Int J Pharm Clin Res. 2016;8(10):1381-1386.

40. Osterhoudt KC. Developing antidote availability programs. Clin Toxicol. 2009;47(3):187-188.

41. Bundotich JK, Gichuhi M. Acute poisoning in the Rift Valley provincial general hospital, Nakuru, Kenya: January to June 2012. S Afr Fam Pract. 2015;57(3):1-5.