Knowledge, Attitudes, And Practices (KAP) of Community Pharmacists Towards Proper Disposal of Expired Medications in Koronadal City, South Cotabato

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ABSTRACT

This study evaluated the knowledge, attitudes, and practices (KAP) of community pharmacists regarding the proper disposal of expired medications in Koronadal City, South Cotabato. Specifically, it aimed to determine the level of knowledge, attitudes, and practices of community pharmacists and identify significant relationships among these variables. The study utilized a descriptive-correlational research design involving thirty community pharmacists as respondents. Data were collected using a validated survey questionnaire and analyzed using descriptive statistics and correlation analysis. Findings revealed that community pharmacists demonstrated a high level of knowledge regarding disposal methods, environmental risks, and regulatory guidelines related to pharmaceutical waste management. Respondents also exhibited highly positive attitudes toward proper disposal, emphasizing public safety, environmental protection, and professional responsibility. In terms of practices, pharmacists consistently complied with proper disposal procedures, including segregation, labeling, inventory monitoring, and coordination with authorized disposal providers. However, minor gaps were observed in awareness of penalties, reporting procedures, documentation practices, disposal scheduling, and the use of official manuals. The study further found that pharmacists experienced moderate challenges related to resource limitations and awareness barriers, particularly insufficient disposal facilities, budget constraints, and limited dissemination of regulatory information. Correlation analysis revealed significant positive relationships among knowledge, attitudes, and practices, indicating that higher knowledge levels are associated with more favorable attitudes and better disposal practices. Consequently, the null hypothesis was rejected in favor of the alternative hypothesis. The study concludes that community pharmacists in Koronadal City possess adequate competence and positive professional behavior regarding the proper disposal of expired medications, highlighting the importance of continuous education, strengthened regulatory support, and improved pharmaceutical waste management practices.

Keywords: Knowledge, Attitudes, Practices, Community Pharmacists, Expired Medications, Proper Disposal, Pharmaceutical Waste Management

INTRODUCTION

Proper disposal of medicines is a critical concern in public health and environmental safety, given the increasing use of pharmaceuticals in communities. According to Hajj et al. (2023), inappropriate disposal methods lead to water contamination, accidental poisoning, and the misuse of expired drugs. Similarly, improper disposal of pharmaceutical waste, such as discarding medicines in regular garbage or flushing them down toilets, is still commonly practiced in many households and pharmacies, posing significant ecological risks. Community pharmacists, as among the most accessible health professionals, play a vital role in raising public awareness of safe medicine disposal practices. Therefore, this study aims to assess their knowledge, attitudes, and practices (KAP) to promote responsible pharmaceutical waste management.

Globally, the situation remains concerning, including in countries such as India, where the improper disposal of expired medications remains a challenge. Raja et al. (2022) found that many Indian pharmacists reported limited

training in proper disposal practices and inadequate facilities, which affected the guidance they provided to patients. International studies further suggest that active pharmacist engagement can significantly reduce pharmaceutical pollution in communities. Although drug take-back programs exist in many regions, participation and compliance remain inconsistent, highlighting the need for continued awareness campaigns. This underscores the importance of evaluating pharmacists' roles in medication disposal worldwide.

In the Philippines, particularly in Pasig City, concerns about the disposal of expired medication have also been documented. Apostol et al. (2022) reported that many Filipino pharmacists still rely on improper practices, such as disposing of medicines with mixed waste, largely due to inadequate guidelines and infrastructure. Although the Food and Drug Administration (FDA) has issued advisories, implementation in community pharmacies remains inconsistent. Studies also indicate that public awareness remains low even in urban areas such as Pasig City, placing greater responsibility on pharmacists to educate consumers. This highlights the need for ongoing assessment of pharmacists' competence and practices regarding proper drug disposal at the national level.

Despite the growing body of literature, there remains limited research focusing specifically on pharmacists working in barangay-level communities. Most existing studies focus on hospital pharmacies or large commercial drugstore chains, leaving a gap in understanding community-based pharmacists' practices. In addition, there is a lack of localized data on medication disposal practices in barangays within Koronadal City. Without such information, policymakers and health authorities may find it difficult to design targeted interventions. This gap highlights the need for a focused study in a barangay setting.

This study will examine the level of knowledge, attitudes, and practices (KAP) regarding the proper disposal of expired medicines among community pharmacists in Koronadal City, South Cotabato. It will also assess how pharmacists' knowledge and beliefs align with their actual disposal practices and identify challenges affecting compliance with proper drug disposal protocols. Based on the findings, the study aims to develop recommendations for improving pharmaceutical waste management at the community level. Ultimately, this research seeks to strengthen public health protection and environmental safety within barangay communities.

Objectives of the Study

This study aimed to determine the knowledge, attitudes, and practices of community pharmacists regarding the proper disposal of expired medications in Koronadal City, South Cotabato. Specifically, it sought to:

- Determine the level of knowledge of community pharmacists regarding proper disposal of expired medications in terms of: (a) Disposal Methods, (b) Environmental Risks, and (c) Regulatory Guidelines.
- Determine the level of attitudes of community pharmacists regarding proper disposal of expired medications in terms of: (a) Perceived Importance, (b) Willingness to Participate, and (c) Professional Responsibility.
- Determine the level of practices of community pharmacists regarding proper disposal of expired medications in terms of: (a) Disposal Methods Used, (b) Disposal Frequency, and (c) Guideline Adherence.
- Identify the challenges encountered by community pharmacists regarding proper disposal of expired medications.
- Determine whether a significant relationship exists among knowledge, attitudes, and practices regarding proper disposal of expired medications.

Justification of the Study

Improper disposal of expired medications poses significant risks to public health and environmental safety. Community pharmacists serve as key healthcare professionals responsible for ensuring proper pharmaceutical waste management and educating the public regarding safe disposal practices. However, limited local evidence exists regarding pharmacists' knowledge, attitudes, and practices related to expired medication disposal in Koronadal City. The findings of this study may serve as a basis for policy enhancement, educational interventions, and future pharmaceutical waste management programs.

Research Questions

1. What is the level of knowledge of community pharmacists regarding proper disposal of expired medications?

2. What is the level of attitudes of community pharmacists regarding proper disposal of expired medications?

3. What is the level of practices of community pharmacists regarding proper disposal of expired medications?

4. What challenges do community pharmacists encounter in the proper disposal of expired medications?

5. Is there a significant relationship among knowledge, attitudes, and practices regarding proper disposal of expired medications?

Research Hypothesis

H0: There is no significant relationship among the knowledge, attitudes, and practices of community pharmacists regarding the proper disposal of expired medications.

H1: There is a significant relationship among the knowledge, attitudes, and practices of community pharmacists regarding the proper disposal of expired medications.

Definition of Terms

Knowledge – refers to the pharmacists' understanding of disposal methods, environmental risks, and regulatory guidelines concerning expired medication disposal.

Attitudes – refer to pharmacists' beliefs, perceptions, willingness, and professional responsibility regarding proper medication disposal.

Practices – refer to the actual disposal behaviors and compliance activities performed by pharmacists when handling expired medications.

Expired Medications – pharmaceutical products that have exceeded their designated expiration dates and are no longer suitable for use.

Community Pharmacists – licensed pharmacists practicing in community pharmacy settings within Koronadal City, South Cotabato.

Pharmaceutical Waste Management – the systematic handling, segregation, storage, transportation, and disposal of pharmaceutical waste to minimize risks to public health and the environment.

METHODOLOGY

Study Design

A quantitative descriptive-correlational research design was applied in this study, which is considered highly appropriate for determining the levels of knowledge, attitudes, and practices (KAP) of community pharmacists regarding the proper disposal of expired medications. As Prosen (2022) affirms, 'Descriptive research offers a way to systematically and clearly present facts and interpretations,' making it suitable for studies aimed at measuring prevailing conditions using numerical data. In this design, the researchers assessed pharmacists' knowledge of disposal methods, environmental risks, and regulatory guidelines, as well as their attitudes and reported practices, using structured survey questionnaires. Additionally, the study employed a quantitative correlational framework to examine the direction and strength of relationships among community pharmacists' knowledge, attitudes, and practices. As explained by Flotildes et al. (2023), research not only aims to describe professional experiences but can also quantify relationships among different variables.

Critically, the operational parameters assessed in this study are explicitly tied to established health determinants and structured public health care delivery chains. Institutional knowledge benchmarks, systematic guideline adherence, and institutional policy configurations represent environmental, educational, and social health determinants that heavily shape individual professional capacity. Concurrently, the behavioral indicators of baseline pharmacist disposal habits are fundamentally linked to the determinants of preventive, promotive, palliative, and rehabilitative care within community medication management platforms. Proper disposal mitigates toxic pharmaceutical infiltration into local biomes, thereby preventing public exposure and serving a vital environmental healthcare role.

Study Area

The study was conducted in Koronadal City, South Cotabato, Philippines. A total of 30 for final respondents and 15 for pilot study, a total of 45 on distinct community pharmacies operating within the city boundaries were designated as the target data collection locations, ensuring a wide ecological representation across various local barangay hubs.

Method of Data Collection & Data Collection Procedure

The data tracking process initiated with the development and subsequent expert validation of the research survey instrument. It then underwent pilot testing among a small group of community pharmacists outside the study area to further refine the instrument and address any ambiguity in the items. This process ensured that the questionnaire accurately measured the knowledge, attitudes, and practices (KAP) of community pharmacists regarding the proper disposal of expired medications. Upon establishing content validity, formal approvals were secured from the local government units of Koronadal City and individual pharmacy owners. Field work was systematically executed via on-site visits to the 30 participating retail drugstores. The investigators personally distributed and gathered the completed tools from the key informants, providing sufficient completion windows to prevent any workflow disruption.

Participants of the Study & Sampling Technique

The study was composed of one (1) licensed community pharmacist selected per facility across the thirty (30) identified community pharmacies in Koronadal City, culminating in an evaluation sample size of n = 30 respondents. As according to Department of Health regional office, there are only 55 community pharmacists active within the city of Koronadal and we utilized 15 respondents for pilot testing and 30 for final respondents, a total of 45 community Pharmacists. The selection technique executed was purposive sampling, a non-probability sampling methodology chosen to deliberately capture key informants directly responsible for daily stock handling and pharmaceutical waste enforcement.

The use of approximately thirty respondents is supported by several studies in pharmacy and public health research. Alfian et al. (2023) found that a sample size of thirty was sufficient in generating reliable preliminary data on pharmacy practices. Similarly, Kanyari et al. (2024) and Abinaya et al. (2024) reported that meaningful results can be obtained from a limited number of respondents when participants possess relevant professional expertise. In addition, Akkajit et al. (2020) emphasized that small but appropriate samples are commonly used in studies involving pharmaceutical waste management in hospital settings, while Sitotaw and Philipos (2023) highlighted the effectiveness of community-level sampling in assessing medication handling practices. Collectively, these studies support the adequacy of using thirty licensed community pharmacists as respondents for this study.

Limitations

Given the constrained sample size of n = 30 and the deployment of a non-probability purposive sampling framework, statistical power and precision are inherently limited, and external generalizability beyond the immediate boundary of Koronadal City is constrained.

The single-respondent-per-site approach risks over-capturing individual perspectives while potentially under-representing intra-pharmacy variation or staff turnover dynamics. Furthermore, the cross-sectional design restricts the capacity to establish causal links, whether advanced knowledge directly dictates superior practices. Finally, objective verification and contextualized outcome measures—including direct segregation audits, official disposal receipts, environmental residue assessments, or community exposure indicators—are omitted from the scope of this baseline survey structure.

Study Instrument

The data was obtained using a structured researcher-developed survey questionnaire designed specifically to capture demographic details alongside dedicated segments evaluating knowledge (15 indicators), attitudes (15 indicators), practices (15 indicators), and perceived barriers.

The detailed operational item array utilized for this fieldwork is presented in Appendix A of this document.

Data Analysis

The collected responses were coded and analyzed using software computing platforms. Descriptive statistical metrics, specifically weighted mean and standard deviation (SD), were used to evaluate objectives 1 through 4.

For objective 5, the Pearson r product-moment correlation analysis was used to determine the significance of the relationships among the knowledge, attitudes, and practices scores at an alpha value of $p < .001$.

RESULTS AND DISCUSSION

The quantitative distributions and analytical parameters generated from the survey data are compiled in the tables below:

Table 1. Table of Interpretation

Scale Range (Mean Score)	Qualitative Description	Interpretation
3.25 – 4.00	Strongly Agree	Very high level of knowledge/attitude/practice
2.50 – 3.24	Agree	High level of knowledge/attitude/practice
1.75 – 2.49	Disagree	Low level of knowledge/attitude/practice
1.00 – 1.74	Strongly Disagree	Very low level of knowledge/attitude/practice

Table 2. Validity and Reliability Test of the Research Instrument

Variables	No. of Items	Cronbach's Alpha	Interpretation
Knowledge	15	0.89	Good
Attitudes	15	0.84	Good
Practices	15	0.75	Acceptable
Challenges in Proper Disposal	15	0.96	Excellent
Overall	15	0.89	Good

Table 3. Level of Knowledge of Community Pharmacists on Proper Disposal of Expired Medication in Terms of Disposal Methods

Indicators	Mean Ratings	SD	Qualitative Description
1. I am aware of the proper steps to segregate expired medications before disposal.	3.83	0.461	Strongly Agree
2. I understand the recommended procedures for disposing of solid, liquid, and injectable medications.	3.73	0.450	Strongly Agree
3. Handling expired medications correctly prevents contamination.	3.87	0.346	Strongly Agree
4. I am familiar with approved storage methods for expired medications.	3.87	0.346	Strongly Agree
5. Safe disposal techniques reduce environmental hazards.	3.83	0.379	Strongly Agree
TOTAL AVERAGE	3.83	0.396	Strongly Agree

Table 4. Level of Knowledge of Community Pharmacists on Proper Disposal of Expired Medications in Terms of Environmental Risks

Indicators	Mean Ratings	SD	Qualitative Description
1. I am knowledgeable about the environmental impact of improper disposal of medications.	3.83	0.379	Strongly Agree
2. I understand how expired medications can contaminate water systems and soil.	3.83	0.379	Strongly Agree
3. Improper disposal can harm wildlife.	3.80	0.407	Strongly Agree

4. I am aware of the health risks to the community associated with discarded medications.	3.80	0.407	Strongly Agree
5. Following proper disposal practices helps prevent environmental pollution.	3.80	0.407	Strongly Agree
TOTAL AVERAGE	3.81	0.396	Strongly Agree

Table 5. Level of Knowledge of Community Pharmacists on Proper Disposal of Expired Medications in Terms of Regulatory Guidelines

Indicators	**Mean Ratings**	**SD**	**Qualitative Description**
1. I am familiar with local regulations regarding expired medication disposal.	3.73	0.450	Strongly Agree
2. I am aware of national guidelines for proper disposal set by the DOH/FDA.	3.77	0.430	Strongly Agree
3. Pharmacists have legal responsibilities in the disposal of expired medications.	3.70	0.466	Strongly Agree
4. I can identify penalties for non-compliance with disposal regulations.	3.43	0.568	Strongly Agree
5. Proper reporting procedures should be followed when disposing of expired drugs.	3.60	0.563	Strongly Agree
TOTAL AVERAGE	3.65	0.495	Strongly Agree

Table 6. Level of Attitudes of Community Pharmacists on Proper Disposal of Expired Medications in Terms of Perceived Importance

Indicators	Mean Ratings	SD	Qualitative Description
1. I believe proper disposal of expired medications is essential for public safety.	3.80	0.407	Strongly Agree
2. I think following disposal procedures protects the environment.	3.77	0.430	Strongly Agree
3. Proper disposal of expired medications is a key professional responsibility.	3.73	0.450	Strongly Agree
4. I consider safe disposal important to prevent accidental poisoning.	3.77	0.430	Strongly Agree
5. Adhering to proper disposal practices enhances professional credibility.	3.83	0.379	Strongly Agree
TOTAL AVERAGE	3.78	0.419	Strongly Agree

Table 7. Level of Attitudes of Community Pharmacists on Proper Disposal of Expired Medications in Terms of Willingness Participation

Indicators	Mean Ratings	SD	Qualitative Description
1. I am willing to participate in training programs on safe disposal.	3.77	0.430	Strongly Agree
2. I actively seek updates on new disposal methods.	3.60	0.498	Strongly Agree
3. Colleagues should be encouraged to follow proper disposal procedures.	3.87	0.346	Strongly Agree

4. I cooperate with regulatory bodies to ensure safe disposal.	3.67	0.479	Strongly Agree
5. Implementation of proper disposal practices is embraced in my workplace.	3.83	0.379	Strongly Agree
TOTAL AVERAGE	3.75	0.426	Strongly Agree

Table 8. Level of Attitudes of Community Pharmacists on Proper Disposal of Expired Medications in Terms of Professional Responsibility

Indicators	Mean Ratings	SD	Qualitative Description
1. I believe ensuring expired medications are disposed of properly is part of my duty.	3.93	0.254	Strongly Agree
2. Educating clients about safe disposal practices is important.	3.87	0.346	Strongly Agree
3. I think ethical practice includes proper disposal of expired medications.	3.87	0.346	Strongly Agree
4. Compliance with disposal guidelines reflects professional accountability.	3.80	0.407	Strongly Agree
5. Responsibility is taken to maintain safety standards in the pharmacy.	3.83	0.379	Strongly Agree
TOTAL AVERAGE	3.86	0.346	Strongly Agree

Table 9. Level of Practices of Community Pharmacists on Proper Disposal of Expired Medications in Terms of Disposal Methods Used

Indicators	Mean Ratings	SD	Qualitative Description
1. I separate expired medications from usable stock.	3.87	0.346	Strongly Agree
2. Approved methods are followed for	3.83	0.379	Strongly Agree

disposing of all types of expired medications.			
3. I use recommended containers and labeling for expired drugs.	3.80	0.407	Strongly Agree
4. Authorized disposal service providers are coordinated with regularly.	3.70	0.535	Strongly Agree
5. I never dispose of medications directly into drains or trash bins.	3.67	0.661	Strongly Agree
TOTAL AVERAGE	3.77	0.466	Strongly Agree

Table 10. Level of Practices of Community Pharmacists on Proper Disposal of Expired Medications in Terms of Disposal Frequency

Indicators	**Mean Ratings**	**SD**	**Qualitative Description**
1. I routinely check the inventory for expired medications.	3.80	0.407	Strongly Agree
2. Expired medications are disposed of promptly according to schedule.	3.70	0.535	Strongly Agree
3. I monitor stock regularly to ensure timely disposal.	3.73	0.450	Strongly Agree
4. Expired medications are not kept beyond the recommended disposal period.	3.53	0.730	Strongly Agree
5. I consistently document disposal activities.	3.53	0.629	Strongly Agree
TOTAL AVERAGE	3.66	0.550	Strongly Agree

Table 11. Level of Practices of Community Pharmacists on Proper Disposal of Expired Medications in Terms of Guideline Adherence

Indicators	Mean Ratings	SD	Qualitative Description
1. I follow regulatory guidelines consistently for disposal.	3.73	0.450	Strongly Agree
2. Official protocols or manuals are consulted when disposing of expired medications.	3.63	0.556	Strongly Agree
3. Staff are instructed to comply with proper disposal procedures.	3.77	0.430	Strongly Agree
4. I perform internal checks to confirm proper disposal practices.	3.70	0.466	Strongly Agree
5. Disposal practices are updated according to new regulations.	3.73	0.450	Strongly Agree
TOTAL AVERAGE	3.71	0.470	Strongly Agree

Table 12. Challenges Encountered by Community Pharmacists in the Proper Disposal of Expired Medications in Terms of Resource Limitations

Indicators	Mean Ratings	SD	Qualitative Description
1. Lack of proper disposal containers hinders my ability to implement proper disposal.	2.43	1.040	Disagree
2. I am affected by limited budget for safe disposal practices.	2.57	1.006	Agree
3. Insufficient disposal facilities create challenges in my practice.	2.90	1.029	Agree

4. I lack necessary equipment for proper segregation.	2.43	1.006	Disagree
5. Shortage of personnel affects timely disposal of expired medications.	2.30	0.988	Disagree
TOTAL AVERAGE	2.53	1.014	Agree

Table 13. Challenges Encountered by Community Pharmacists in the Proper Disposal of Expired Medications in Terms of Awareness Barriers

Indicators	Mean Ratings	SD	Qualitative Description
1. I think some pharmacists lack adequate training on proper disposal practices.	2.70	0.952	Agree
2. Clients often do not know the proper disposal methods.	2.90	0.885	Agree
3. Outdated information on disposal procedures affects compliance.	2.93	0.740	Agree
4. I feel dissemination of regulations is limited in some areas.	3.10	0.803	Agree
5. Awareness campaigns on safe disposal are insufficient.	3.00	0.947	Agree
TOTAL AVERAGE	2.93	0.865	Agree

Table 14. Challenges Encountered by Community Pharmacists in the Proper Disposal of Expired Medications in Terms of System Constraints

Indicators	Mean Ratings	SD	Qualitative Description
1. Collection policies for expired medications are not fully implemented.	2.63	0.964	Agree

2. Collection policies for expired medications are not fully implemented.	2.60	0.932	Agree
3. Disposal regulations are sometimes unclear or inconsistent.	2.40	0.932	Disagree
4. Transportation of expired medications to authorized facilities is difficult.	2.17	0.913	Disagree
5. Administrative procedures limit efficient disposal of expired drugs.	2.40	1.003	Disagree
TOTAL AVERAGE	2.44	0.949	Disagree

Table 15. Significant Relationship Among the Knowledge, Attitudes, and Practices of Community Pharmacists on the Proper Disposal of Expired Medications

Paired Variables	df	r	p-value	Interpretation	Decision
Knowledge & Attitudes	28	0.753	<.001	Strong/ High Relationship	Significant*
Knowledge & Practices	28	0.788	<.001	Strong/ High Relationship	Significant*
Attitudes & Practices	28	0.769	<.001	Strong/ High Relationship	Significant*

Narrative Interpretation & Synthesis

As compiled above, community pharmacists demonstrated a consistently high level of knowledge regarding the proper disposal of expired medications, with an overall mean of 3.83 (SD = 0.396). Among the specific indicators, the highest mean ratings were observed in statements regarding the prevention of contamination through proper handling and familiarity with approved storage methods (M = 3.87, SD = 0.346). The low standard deviation in these items indicates a strong consensus among respondents, reflecting a shared understanding of safety and environmental protection principles, likely due to formal pharmacy education and workplace protocols. These findings align with Garcia and Tugna (2024), who emphasized the importance of pharmacists' awareness of proper handling. On the other hand, the item concerning specific procedures for liquid and injectable formulations scored lowest (M = 3.73, SD = 0.450), indicating minor variation in confidence depending on dosage forms. This implies that while general knowledge is strong, more specific procedural training is still needed, as highlighted by Lota et al. (2022).

Environmental risk parameter groups (Table 4) matched this strong baseline with a total mean of 3.81 (SD = 0.396), reflecting a clear understanding of water and soil contamination dynamics. This consensus supports

findings from Nairat et al. (2023) and Raja et al. (2022). Regulatory framework understanding (Table 5) presented an overall mean score of 3.65 (SD = 0.495). While familiarity with national guidelines set by the DOH and FDA was high (M = 3.77, SD = 0.430), clear gaps were found in tracking specific non-compliance penalties (M = 3.43, SD = 0.568) and documentation reporting workflows (M = 3.60, SD = 0.563). This structural discrepancy suggests that professional training focuses heavily on general regulatory principles while under-emphasizing accountability measures, as noted by Kharaba et al. (2022) and Sitotaw and Philipos (2023).

Attitude indicators (Tables 6, 7, and 8) show a strong sense of professional identity, with high scores across perceived importance (M = 3.78), willingness to participate (M = 3.75), and professional responsibility (M = 3.86). Pharmacists link compliant disposal habits directly to ethical standards and professional credibility (M = 3.83, SD = 0.379), which matches observations by Banaga (2020). Peer encouragement had a notable impact on workplace practices (M = 3.87, SD = 0.346), supporting Kanyari et al. (2024)'s view that workplace culture influences compliance. However, self-directed learning for updating independent protocols scored lowest (M = 3.60, SD = 0.498), indicating a reliance on formal institutional updates rather than proactive information seeking, as noted by Enopia et al. (2024). Pharmacists strongly internalized the moral duty of public safety (M = 3.93, SD = 0.254), which aligns with findings from Manupac and Cruz (2024), Gamboa et al. (2021), and Alenezi et al. (2023).

Operational practice indicators (Tables 9, 10, and 11) show a high level of compliance with proper disposal protocols. Stock segregation scored highest (M = 3.87, SD = 0.346), showing that pharmacists consistently separate expired inventory from active products to protect consumer safety. This confirms practices highlighted by Alnahas et al. (2020). Proper containment and labeling compliance were also high (M = 3.80, SD = 0.407), matching trends reported by Hajj et al. (2023). In contrast, the direct disposal parameter scored lowest (M = 3.67, SD = 0.661), showing that external factors can lead to inconsistent disposal habits, as documented by Marwa et al. (2021). Inventory management protocols (Table 10) showed regular checking habits (M = 3.80, SD = 0.407). However, maintaining rigid disposal timelines (M = 3.53, SD = 0.730) and documentation logs (M = 3.53, SD = 0.629) was more challenging, suggesting that high workloads or logistical limits can slow down disposal efforts, which aligns with findings from Akande-Sholabi et al. (2025) and Banluta et al. (2025). Guideline compliance (Table 11) was supported by strong staff supervision (M = 3.77, SD = 0.430). However, regular use of official manuals was lower (M = 3.63, SD = 0.556), suggesting that pharmacists often rely on routine habits rather than consulting formal documentation, as noted by Peña et al. (2025).

Analysis of challenges (Tables 12, 13, and 14) shows that limited access to specialized waste facilities (M = 2.90, SD = 1.029) and budget limits (M = 2.57, SD = 1.006) are the main resource barriers. These infrastructure issues align with findings from Apostol et al. (2022) and Enopia et al. (2024). Awareness barriers were also significant, particularly limited dissemination of regulations in remote areas (M = 3.10, SD = 0.803) and weak public awareness campaigns (M = 3.00, SD = 0.947). This supports findings from Chandrasena et al. (2024) and Cabañas and Rañosa-Madrunio (2020). System constraints (Table 14) were generally rated low, indicating that transportation logistics and regulatory clarity are sufficient, matching observations by Jankie et al. (2022) and Prosen (2022). However, inconsistent policy enforcement remains an issue (M = 2.63, SD = 0.964).

Correlation data (Table 15) shows strong, positive, and significant relationships among all three dimensions at $p < .001$. The correlation between knowledge and practices ($r = .788$) shows that improving institutional knowledge is an effective way to improve actual field practices, which aligns with Alnahas et al. (2020). The correlation between attitudes and practices ($r = .769$) and knowledge and attitudes ($r = .753$) further supports rejecting the null hypothesis (H_0), confirming that these dimensions are closely linked, as noted by Cabuhat et al. (2024) and Hiew and Low (2024).

Summary of Findings

• **SOP 1 (Knowledge):** Community pharmacists demonstrated a high level of knowledge across all assessed domains (M = 3.83). However, awareness of non-compliance penalties (M = 3.43) and documentation procedures (M = 3.60) scored lower, showing gaps in understanding legal enforcement mechanisms.

• **SOP 2 (Attitudes):** Pharmacists showed highly positive attitudes toward proper disposal (M = 3.78). They linked proper disposal directly to public safety and professional credibility, though proactive self-directed learning scored lower (M = 3.60).

• **SOP 3 (Practices):** Compliance with proper disposal methods was high (M = 3.77), with stock segregation scoring highest (M = 3.87). Documentation consistency (M = 3.53) and the use of official reference manuals (M = 3.63) were lower.

• **SOP 4 (Challenges):** Resource limitations and awareness barriers are the primary challenges. Insufficient disposal facilities (M = 2.90) and limited distribution of regulatory updates (M = 3.10) were highlighted as key issues, while logistics and staffing were not seen as major barriers.

• **SOP 5 (Correlations):** Knowledge, attitudes, and practices are strongly and positively correlated ($p < .001$), with the link between knowledge and practices being the strongest ($r = .788$). The null hypothesis is rejected.

CONCLUSION

Based on the study's findings, community pharmacists in Koronadal City, South Cotabato, have a high level of knowledge, positive attitudes, and appropriate practices in the proper disposal of expired medications. Pharmacists are well-informed about disposal methods, environmental risks, and regulatory guidelines, though minor gaps remain in their awareness of enforcement mechanisms, such as penalties and reporting procedures. They also show strong professional attitudes characterized by recognition of the importance of proper disposal, willingness to participate in related activities, and a strong sense of professional responsibility, despite limited engagement in self-directed learning and slight variations in regulatory compliance perceptions.

In terms of practices, pharmacists consistently apply proper disposal procedures, including segregation, use of appropriate containers, coordination with authorized disposal services, inventory monitoring, and adherence to regulatory guidelines. However, some inconsistencies exist in documentation practices, disposal scheduling, and the use of formal manuals. The study further concludes that pharmacists experience moderate challenges, primarily related to resource limitations and awareness barriers, including insufficient disposal facilities, budget constraints, and limited dissemination of regulatory information. In contrast, system-related constraints are generally not major obstacles.

Finally, the study establishes that knowledge, attitudes, and practices are significantly and positively interrelated. This indicates that higher levels of knowledge are associated with more favorable attitudes and better disposal practices, while positive attitudes also reinforce proper disposal behavior. Therefore, the null hypothesis is rejected in favor of the alternative hypothesis, confirming that a significant relationship exists among knowledge, attitudes, and practices regarding the proper disposal of expired medications.

Recommendations

- Community Pharmacists: Engage in continuous training with a focus on reporting workflows and penalty guidelines, and pursue self-directed updates.
- Pharmacy Establishments: Provide formal reference manuals, standardize documentation logs, and enforce disposal schedules.
- Regulatory Agencies: Improve the distribution of updates on penalties and enforcement mechanisms, and expand accredited disposal options.
- Academic Institutions: Enhance pharmacy curricula with practical training and simulations focused on waste management and disposal regulations.
- Future Research: Conduct larger probability-sampled quantitative studies and qualitative assessments to further evaluate disposal practices.

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APPENDIX A: Field Data Collection Tool

This appendix explicitly outlines the operational tool deployed during the fieldwork survey phase to measure knowledge, attitudes, practices, and specific resource boundaries across the designated community pharmacies.

Knowledge Dimension Items

- Awareness of multi-step segregation procedures before disposal.
- Understanding explicit technical disposal routes for liquid, solid, and injectable formulations.
- Perception regarding containment of localized environmental contamination.
- Familiarity with regulatory-approved holding areas and temporary storage configurations.
- Knowledge concerning environmental risk minimizations via compliant handling techniques.

Attitude Dimension Items

- Perceived importance of pharmaceutical waste safety regarding baseline public wellness.
- Belief regarding long-term ecotoxicological safety and water table protection.
- Internalization of disposal protocols as a critical pillar of daily professional pharmaceutical duties.
- Perception regarding safe disposal methods for preventing accidental residential poisonings.
- Belief that compliance with advanced handling workflows actively elevates retail pharmacy credibility.

Practice Dimension Items

- Consistent separation of expired inventory from active shelves to eliminate dispensing errors.
- Adherence to precise prescriptive disposal techniques matching regional regulations.
- Routine utilization of dedicated hazard containment bins with explicit classification labeling.
- Frequency of active coordination protocols with certified reverse-distribution or waste handling providers.
- Prohibition of discarding unsorted pharmaceutical waste into common municipal sewage networks or municipal dumps.