Assessing Knowledge, Attitudes, and Practices of Medication Disposal: A Study on Rural Communities in Sarojini Nagar, Lucknow

Saurabh Kashyap¹, Akshata MA², Anubhav Agrawal², Abhishek Singh¹, Aman Verma³, Ish Gupta⁴

¹Assistant Professor, ²Junior Resident Doctor, Department of Community Medicine and Public Health, King George's Medical University, Lucknow, India

 3 MBBS, 4 Under Graduate Student, King George's Medical University, Lucknow, India

Correspondence: Dr. Abhishek Singh, Email: abhishekstats@gmail.com

Abstract:

Introduction: The increasing global consumption of medications has led to a significant rise in the improper disposal of unused and expired drugs, posing risks to both human health and the environment. Objective: This study aims to evaluate the understanding, beliefs, and behaviours related to the disposal of such medications within the rural community of Sarojini Nagar, Lucknow. Method: A cross-sectional study was conducted in June 2024 with 317 participants from rural Sarojini Nagar, including patients and attendants visiting the General and NCD OPD of PHC Sarojininagar, chosen purposively. Participants aged 18 years and above who provided consent were included, while those with cognitive or communication issues were excluded. Participants were interviewed by Junior Residents and Data was gathered using a structured questionnaire to evaluate demographic characteristics, knowledge, perceptions, attitudes, and practices related to the disposal of unused and expired medications. Results: The study revealed a lack of awareness about proper disposal methods, with 77.3% of participants reporting no prior information on the subject. Only 14.8% were aware of drug take-back policies. A majority (87.9%) recognized the harmful effects of improper disposal, and 93.7% agreed that such practices negatively impact the environment. Despite this, 69.4% of participants reported keeping unused medications at home, and 78.0% disposed of expired medications by throwing them in household trash. **Conclusion:** The findings highlight a significant gap in knowledge and practices regarding safe drug disposal among rural community of Sarojini Nagar. There is an urgent need for targeted educational programs and the implementation of effective drug take-back systems to mitigate the risks associated with improper disposal. Raising awareness and providing clear guidance on safe disposal methods are crucial steps towards protecting public health and the environment in these communities.

Keywords: Environmental Pollution, Pharmaceutical Preparations, Public Health, Rural Health, Waste Disposal-Solid.

Introduction:

The global rise in medication consumption, driven by increased availability, affordability, and health awareness, has led to challenges like irrational use and improper disposal. According to WHO, 50% of medications are prescribed or used inappropriately, with many remaining unused and expiring.^[1,2] Expired drugs can lose efficacy, pose health risks, contribute to antibiotic resistance, and lead to accidental poisoning or drug abuse.^[3] Despite the

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dangers, many consumers lack awareness about proper disposal methods, often storing, sharing, or discarding medications unsafely.^[4] These practices harm humans, wildlife, and the environment, as improper disposal methods like trashing or flushing are common.^[5,6]

Studies from Kenya, Nigeria, and Indonesia highlight garbage bins and toilets as primary disposal methods for unused medications.^[7,8] In India, research has detected pharmaceutical residues in the Ganges River, reflecting a lack of effective disposal systems.^[9] Unlike developed nations like Canada, Australia, and Sweden, where robust take-back programs exist, India lacks efficient systems and guidelines for over-the-counter medication disposal, exacerbating the problem.^[10]

Rural areas face unique challenges due to limited healthcare facilities, pharmacies, and awareness about safe disposal practices. Accumulation of expired medications increases risks, especially for children and the elderly. Rural households may also lack access to drug take-back programs, leading to improper disposal behaviours.^[6]

The WHO and FDA recommend various strategies for safe drug disposal, including incineration, chemical decomposition, landfilling, and take-back programs.^[11,12] However, implementation in India remains inadequate. Understanding the attitudes and behaviours surrounding drug disposal in rural communities is essential for developing targeted interventions. This study aims to evaluate knowledge, beliefs, and practices regarding unused and expired medications in Sarojini Nagar, Lucknow, to address this critical gap and promote safer disposal practices.

Method:

The current descriptive cross-sectional study was conducted among 317 patients, who were

purposively selected in June 2024 from the Outpatient Department (OPD) of Sarojini Nagar Primary Health Centre (PHC), a field practice area of the Department of Community Medicine and Public Health, King George's Medical University, Lucknow. The study included respondents aged 18 years and above who visited the General and Non-Communicable Disease (NCD) OPD of PHC Sarojini Nagar during the study period. Inclusion criteria comprised all individuals aged 18 years and above who visited the PHC and consented to participate. However, respondents with cognitive or communication impairments were excluded from the study.

Data collection: The data was collected on a semistructured pretested questionnaire and respondents were interviewed by Junior residents. All the patients who consented to be a part of study were asked about their understanding, beliefs, and behaviours regarding unused or expired household medications.

Ethical approval was obtained from the Institutional Ethical Committee of King George's Medical University, Lucknow.

Data analysis: Data cleaning was done to ensure data consistency before doing data analysis. Data analysis was done using SPSS version 24 (SPSS-24, IBM, Chicago, USA). Descriptive statistics were presented using frequencies and percentages.

Results:

Table 1 shows that majority of the study participants were females (53.0%). Of the total study participants 48.3% had their graduate degree and 38.5% were unemployed. Males (25.5%) exhibited greater knowledge of proper drug disposal compared to females (20.2%). The highest awareness was observed in the 26-35 age group (34.7%), while the lowest was among those aged 56-65 years (11.5%). Education level significantly influenced knowledge, with postgraduates showing

Variables	Total n (%)	knowledge regarding proper disposal of drugs	
		Yes n (%)	No n (%)
Gender			
Male	149 (47.0)	38 (25.5)	111 (74.5)
Female	168 (53.0)	34 (20.2)	134 (79.8)
Age in years			
18-25	93 (29.3)	14 (15.1)	79 (84.9)
26-35	101 (31.9)	35 (34.7)	66 (65.3)
36-45	49 (15.5)	14 (28.6)	35 (71.4)
46-55	41 (12.9)	5 (12.2)	36 (87.8)
56-65	26 (8.2)	3 (11.5)	23 (88.5)
>65	7 (2.2)	1 (14.3)	6 (85.7)
Education			
Illiterate	15 (4.7)	1 (16.7)	5 (83.3)
Undergraduate	51 (16.1)	9 (17.6)	42 (82.4)
Graduate	153 (48.3)	26 (17.0)	127 (83.0)
Postgraduate	98 (30.9)	36 (36.7)	62 (63.3)
Occupation Status			
Employed	195 (61.5)	60 (30.7)	135 (59.3)
Unemployed	122 (38.5)	12 (9.8)	110 (90.2)

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the highest awareness (36.7%) and illiterate individuals the lowest (16.7%). Employed individuals (30.7%) were more knowledgeable than their unemployed counterparts (9.8%).

Table 2 shows that majority of the study participants knew that improper disposal of drugs is harmful (88.6%), contaminates the environment (80.1%), may kill wildlife (64.7%), and may lead to accidental ingestion by children (67.2%). But most did not have knowledge regarding proper disposal of drugs (77.3%), take-back policy (84.9%), ways to minimise the harmful effects, and person to contact for proper drug disposal.

Table 3 shows that participants attitude towards drug disposal and most of them were agreeing that unused and expired medicine presents potential risk at home (91.5%), improper disposal of medicines affects the environment and health (93.7%), children are more vulnerable to harm produced by improper disposal of medicines (92.7%), awareness and outreach programs should be initiated (96.8%), Pharmacists, Doctors and other Healthcare Professionals should provide advice on safe disposal of medicines (97.5%), Drug take back policy of unused and expired medicines should be introduced in the community (92.1%).

Table 4 shows the practices followed by the study participants in disposal of unused/ expired drugs. Majority of the study participants kept unused drugs at home (69.4%), did not stored medicines at sites accessible to children (84.5%), separated used and unused medicines (88.0%). Majority of the unused (43.2%) and expired drugs (77.9%) were thrown away.

Figure 1 depicts the varieties of medicines stored at home by the study participants, where analgesics (28.64%) were in the top followed by antibiotics, supplements, and anti-hypertensives, syrups, anti-diabetics, and others.

Table 2:	Knowledge regarding disposal of drugs
	among the study participants (N= 317)

Parameter n (%) Received any information about proper disposal of drugs. disposal of drugs. 72 (22.7) No 245 (77.3) Knowledge about take back policy 48 (15.1) No 269 (84.9) Improper disposal of drugs is harmful. 281 (88.6) No 36 (11.4) Improper disposal of drugs contaminates 50 (11.4)
Received any information about properdisposal of drugs.Yes72 (22.7)No245 (77.3)Knowledge about take back policyYes48 (15.1)No269 (84.9)Improper disposal of drugs is harmful.Yes281 (88.6)No36 (11.4)Improper disposal of drugs contaminatesthe environment
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Improper disposal of drugs is harmful.281 (88.6)Yes281 (88.6)No36 (11.4)Improper disposal of drugs contaminates281 (88.6)the environment281 (88.6)
Yes 281 (88.6) No 36 (11.4) Improper disposal of drugs contaminates
No 36 (11.4) Improper disposal of drugs contaminates the environment
Improper disposal of drugs contaminates
the environment
Yes 254 (80.1)
No 63 (19.9)
Improper disposal of drugs may kill wildlife.
Yes 205 (64.7)
No 112 (35.3)
Improper disposal of drugs may lead
to accidental ingestion by children.
Yes 213 (67.2)
No 104 (32.8)
Ways to minimize the harmful effects of improper
disposal of drugs
Providing proper guidance for the 173 (54.6)
disposal of medicines
Prescribing medicines in less quantity 17 (5.4)
Donating or sharing unused medicine 48 (15.1)
Take back Policy at Govt Health 79 (24.9)
Centres for medicines
Who is the appropriate person to inform
about proper drug disposal
Medicine Company 90 (28.4)
Doctor 87 (27.4)
Pharmacist 102 (32.2)
Others (Nurses, news media, etc) 38 (12.0)

In present study 58.0% of the study subjects dispose of expired medicines by throwing them into the household trash, 9.0% by burying them in the ground, 9.0% by flushing them in the sink/ toilet, and 7.7% by mixing them with water for garden plants. A smaller proportion (4.95%) donate them to hospitals, burns them at home (3.71%), throws into

Table 3: Attitude of the study participants about				
the disposal of the drugs (N= 317)				
Parameter	n (%)			
Unused and expired medicine presents potential risk at				
home.				
Agree	290 (91.5)			
Neutral/Not agree	27 (8.5)			
Improper disposal of medicines affects the environment				
and health				
Agree	297 (93.7)			
Neutral/Not agree	20(6.3)			
Are children more vulnerable	to harm produced			
by improper disposal of medicines?				
Agree	294 (92.7)			
Neutral/Not agree	23(7.3)			
Awareness and Outreach Programs	should be initiated			
Agree	307 (96.8)			
Neutral/Not agree	10(3.2)			
Pharmacists, Doctors and other Healthcare Professionals				
should provide advice on safe dispos	al of medicines			
Agree	309 (97.5)			
Neutral/Not agree	8(2.5)			
Drug take back policy of unused an	d expired medicines			
should be introduced in the commun	nity			
Agree	292 (92.1)			
Neutral/Not agree	25(7.9)			

Table 4:Practices followed by the study participants in disposal of drugs (N= 317)

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Parameter	n(%)		
Keep unused medications at home			
Yes	220 (69.4)		
No	97 (30.6)		
Medicines are stored at sites accessible to Children			
Yes	49 (15.5)		
No	268 (84.5)		
Separate unused and expired medicines			
Yes	279 (88.0)		
No	38 (12.0)		
Practices with unused medicines*			
Throw away	191 (43.2)		
Donate to hospital/NGO	22 (5.0)		
Return to Medical store	46 (10.4)		
Keep at home until expired	111 (25.1)		
Give to Friends/Relatives	45 (10.2)		
Others	27 (6.1)		
Practices with expired medicines*			
Throw away	268 (77.9)		
Donate to hospital/NGO	7 (2.0)		
Return to Medical store	27 (7.8)		
Keep at home	23 (6.7)		
Others	19 (5.5)		

Note. *Multiple responses have been recorded.



Figure 1: Types of medicines stored at homes by the study participants (N= 317)

river or lake (3.71%), or feeding to domestic animal (3.21%), some 0.74% of the participants uses unspecified methods.

Discussion:

The current cross-sectional study involving 317 participants revealed several key findings regarding drug disposal practices, attitudes, and knowledge, which can be compared to findings from similar studies in various regions of India, including Singur, Tamil Nadu, Gujarat, Delhi NCR, and Maharashtra. In the current study, 69.4% of participants kept unused medicines at home, a figure comparable to the 67.1% of households in rural Singur^[1] and more than 50% in Tamil Nadu^[9] that also stored unused or expired medications. These similarities highlight that the issue of unused medications being retained at home is prevalent in both rural and urban settings across India.

When comparing the types of medications stored, analgesics were the most common in both the current study (28.64%) and the study from Delhi NCR (38.9%)^[3], followed by antibiotics, supplements, and anti-hypertensives. In contrast, the study in Singur^[1] found that antacids (34.4%) and antipyretics (31.25%) were more commonly stored,

reflecting potential regional differences in the types of medications people keep at home. Despite these variations, all studies point to a significant portion of stored medicines being everyday drugs, indicating a need for greater public education about managing common medications safely.

In terms of unsafe storage practices, the Singur study^[1] reported that all households with unused medications exhibited at least one unsafe storage practice, with 52.1% displaying four or more. Furthermore, 16.7% of households stored medicines within reach of children. In comparison, the current study showed that 84.5% of participants kept medications out of children's reach, highlighting a similarity in storage practices with a subtle margin. However, the current study did not delve as deeply into multiple unsafe storage practices as the Singur study^[1]did, suggesting the need for more comprehensive safety assessments in future research.

Regarding disposal practices, the current study found that 58.0% of participants disposed of expired medications by throwing them in the household trash, while 9.0% buried them, 9.0% flushed them down in sinks or toilets, and 7.7% mixed them with water for garden plants. Similar trends were seen in the Tamil Nadu^[9] and Gujarat studies^[2], where 53.1% and most participants, respectively, disposed of medications in the trash. The study in Delhi NCR^[3] further reinforces this pattern, with 73% of participants discarding expired medications in the household trash, followed by 20% who flushed them in the sewer. These findings demonstrate that improper disposal of medications is a widespread practice, regardless of region, emphasizing the urgent need for better education on safe disposal methods across India.

A significant gap in knowledge about proper drug disposal methods and drug take-back policies was noted across all studies. In the current study, 77.3% of participants were unaware of proper disposal methods, and 84.9% lacked knowledge about drug take-back policies. Similarly, the Tamil Nadu study^[9] reported that 71.2% of participants were unaware of novel disposal practices like takeback systems, and the Gujarat study^[2] echoed this finding, with few participants returning medicines to pharmacies. Even among pharmacists in Maharashtra^[11], 75% were unaware of guidelines for the disposal of expired medications, underscoring the need for widespread awareness programs targeting both the public and healthcare professionals.

Attitudes towards drug disposal were largely positive in all studies. The current study found that most participants recognized the risks of improper drug disposal, with 91.5% agreeing that unused or expired medications pose a potential hazard at home. The Gujarat study^[2] also noted that participants had a positive attitude, acknowledging that improper disposal affects both the environment and public health. Furthermore, support for awareness and outreach programs was strong in both the current study (96.8%) and the Gujarat study, suggesting that the public is open to learning about safer disposal methods but lacks access to the necessary information and resources.

Conclusion:

The current study's findings align closely with those from other regions of India, they collectively underscore a nationwide issue regarding the improper storage and disposal of medications. The high prevalence of unsafe practices and the widespread lack of awareness about proper disposal methods and drug take-back policies highlight the critical need for public health interventions, increased education, and the implementation of effective drug take-back systems across both rural and urban areas.

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Conflicts of interest: Nil

References:

- Maharana S, Paul B, Dasgupta A, Garg S. Storage, reuse, and disposal of unused medications: A cross-sectional study among rural households of Singur, West Bengal. Int J Med Sci Public Health. 2017;1.
- Deshpande S, Mansuri J, Maisuria K, Patel K, Patel V, Patel M, et al. Assessment Of Knowledge, Attitude And Practice Regarding Disposal Of Unused And Expired Medicines. Certified Journal | 2191 Deshpande et al World Journal of Pharmacy and Pharmaceutical Sciences World Journal Of Pharmacy And Pharmaceutical Sciences Sjif Impact Factor [Internet]. 2015;11(8):2192. Available from: www.wjpps.com
- 3. Manocha S, Suranagi UD, Sah RK, Chandane RD, Kulhare S, Goyal N, et al. Current Disposal Practices of Unused and Expired Medicines Among General Public in Delhi and National Capital Region, India. Curr Drug Saf. 2019 Oct 8;15(1):13–9.
- Narwat A, Sindhu A. Practice towards disposal of medicines (unused/expired drugs) among the patients visiting tertiary care teaching hospital in Haryana, India. Int J Res Med Sci. 2019 Jul 25;7(8):3050.
- Chacko CT, Prakash D, Joseph L, Shabaraya A, Author C. A Review on the Attitude and Practice on Self Medication, Storage and Disposal of Drugs in a Community. International

Journal of Research and Review (ijrrjournal.com). 2020;7(8):122.

- Wajid S, Siddiqui NA, Mothana RA, Samreen S. Prevalence and Practice of Unused and Expired Medicine - A Community-Based Study among Saudi Adults in Riyadh, Saudi Arabia. Biomed Res Int. 2020;2020.
- Kumar S L, Logeshwaran L L, Vanitha Rani N, Thennarasu P T, Keerthana M K, Lavanya M L. Assessment of Knowledge and Awareness on the Disposal of Expired and Unused Medicines among Medication Consumers. Journal of Young Pharmacists. 2019 Nov 7;11(4):410–6.
- 8. Toe J, Orok E, Erah P. Assessment of knowledge and disposal practices of unused and expired household medicines in a community in Liberia. Exploratory Research in Clinical and Social Pharmacy. 2023 Dec 1;12.
- Alice A, Sunil A, Nallasamy V, Ramanathan S. Assessment on disposal practices of unused and expired medications. Int J Publ Health Sci. 2022 Sep 1;11(3):935–41.

- N S, Jha A. Knowledge and Awareness Regarding Safe Drug Disposal System among General Population of India. J Pharmacovigil. 2018;06(02).
- 11. Hagawane DB, Parihar NB, Narendra Parihar S. Assessment Of Methods Used By Registered Pharmacists For Disposing Of The Pharmaceutical Waste And Expired Medicines At Community Pharmacies In Urban Area. International Journal of Pharmaceutical Sciences [Internet]. 2022;13(3):1332–7. Available from: www.ijpsr.com
- 12. Kumari A, Alam MS, Kujur M, Kumar S. The Pattern of Disposal Practices of Unused and Expired Medications Among Healthcare Professionals: A Cross-Sectional Survey in Rajendra Institute of Medical Sciences, Ranchi, Jharkhand. Cureus. 2022 Aug 1;14(8):e27555