e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(5); 979-982

Original Research Article

Knowledge, Attitudes, and Practices Toward Eco-pharmacovigilance Among Postgraduate Residents in India: A Cross-Sectional Descriptive Study

Arjun Sanjaykumar Mody[1], Meena Atray[2], Adit Miteshkumar Suthar[3], Yogesh Shashikantbhai Bhut[4], Vishwa Mehta[5]

[1]2nd Year Resident Doctor, Dept. of Pharmacology, R.N.T. Medical College, Udaipur, Rajasthan, India
[2]Senior Professor, Dept. of Pharmacology, R.N.T. Medical College, Udaipur, Rajasthan, India
[3]2nd Year Resident Doctor, Dept. of Pharmacology, R.N.T. Medical College, Udaipur, Rajasthan, India
[4]2nd Year Resident Doctor, Dept. of Pharmacology, R.N.T. Medical College, Udaipur, Rajasthan, India
[5]2nd Year Resident Doctor, Dept. of Pharmacology, R.N.T. Medical College, Udaipur, Rajasthan, India

Received: 14-03-2026 / Revised: 13-04-2026 / Accepted: 28-05-2026
Corresponding Author: Dr. Arjun Sanjaykumar Mody
Conflict of interest: Nil

Abstract:

Background: Pharmaceutical contamination is increasingly recognized as a major environmental concern due to improper disposal and continuous introduction of drug residues into ecosystems. Eco-pharmacovigilance (EPV) aims to minimize these effects through awareness, surveillance, and responsible practices.

Objective: To assess the knowledge, attitudes, and practices regarding eco-pharmacovigilance among postgraduate residents and identify factors associated with safe drug disposal practices.

Methods: A cross-sectional descriptive study was conducted among 102 postgraduate residents at a tertiary care hospital in Southern Rajasthan. A pre-validated questionnaire assessed knowledge, attitude, and practices. Scores were categorized into good, moderate, and poor levels.

Results: Good knowledge and positive attitudes toward eco-pharmacovigilance were observed in 78.2% and 91.4% of participants, respectively. However, only 9.9% demonstrated appropriate disposal practices. The majority of postgraduate residents possessed adequate theoretical knowledge regarding eco-pharmacovigilance and environmental safety, along with positive attitude toward the subject. Despite this, the implementation of safe pharmaceutical disposal practices remained inadequate.

Conclusion: Despite adequate knowledge and positive attitudes, practices remain inadequate. Structured training and institutional interventions are critical to bridging the knowledge–practice gap.

Keywords: Eco-pharmacovigilance, Drug Disposal, KAP Study, Environmental Safety, Postgraduate Residents.
DOI: 10.25258/ijcpr.18.5.160

Introduction

Pharmaceuticals have emerged as significant environmental contaminants due to their widespread use and persistent release into ecosystems [1,2]. These compounds, including antibiotics, hormones, and analgesics, are frequently detected in water bodies and soil, where they exert bioactive effects even at low concentrations [1]. Unlike conventional pollutants, pharmaceuticals demonstrate pseudo-persistence, continuously entering the environment through excretion, hospital waste, and improper disposal of unused medicines [3,4].

The environmental consequences of pharmaceutical contamination are substantial, including antimicrobial resistance, endocrine disruption, and toxicity in aquatic organisms [5,6,7]. In response to these concerns, eco-pharmacovigilance (EPV) has evolved as a discipline focused on identifying, evaluating, and mitigating the environmental risks of pharmaceuticals. It emphasizes rational prescribing, environmentally safe disposal practices, and policy-based interventions [6].

Despite growing awareness, studies consistently demonstrate a gap between knowledge and implementation of safe practices among healthcare professionals [8,9]. In India, where structured drug disposal systems are limited, postgraduate residents play a crucial role in prescribing and patient education [10]. However, data on their awareness and practices related to EPV remain limited, particularly in regional settings [11,12].

This study was therefore undertaken to evaluate knowledge, attitudes, and practices related to eco-pharmacovigilance among postgraduate residents

and to identify factors influencing safe disposal behaviour.

Methods

This cross-sectional descriptive study was conducted among postgraduate residents at a tertiary care teaching hospital in Southern Rajasthan. A total of 102 participants were included using convenience sampling. Only those who provided informed consent and completed the questionnaire were included in the analysis.

Data was collected using a pre-validated structured questionnaire comprising 20 questions divided into knowledge, attitude, and practice domains. Knowledge (10 questions) included questions on basic concepts of eco-pharmacovigilance, sources of pharmaceutical pollution, and environmental impact of drugs. Attitude (5 questions) assessed perceptions regarding responsibility, importance of safe disposal, and environmental concerns. Finally, Practice (5 questions) evaluated personal drug disposal habits, training exposure, and participation in eco-pharmacovigilance activities. Each correct knowledge response was awarded one point, while attitude and practice responses were scored using a Likert-based approach. Composite scores were calculated and categorized into three levels: good (≥75%), moderate (50–74%), and poor (<50%). The questionnaire was distributed via Google Forms, and responses were collected. Ethical approval was obtained from the institutional ethics committee.

Data analysis was performed using statistical software. Descriptive statistics were used to summarize participant characteristics and KAP scores. A p-value of less than 0.05 was considered statistically significant.

Results

Demographic Analysis: A total of 102 postgraduate residents participated in the study. The demographic profile of the participants is summarized in Table 1.

Table 1: Demographic Characteristics of Participants (n = 102)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	58	56.9
	Female	44	43.1
Year of Residency	1st Year	36	35.3
	2nd Year	34	33.3
	3rd Year	32	31.4
Department	Clinical	72	70.6
	Non-clinical	30	29.4
Prior EPV Training	Yes	7	7.1
	No	95	92.9

Table 2: Knowledge, Attitude, and Practice related to Eco-pharmacovigilance (n = 102)

Knowledge regarding Eco-pharmacovigilance	Correct Response (%)
Correct definition of EPV	78.2%
Awareness of primary goal of EPV	86.1%
Knowledge of sources of drug pollution	85.7%
Awareness of entry pathways into environment	88.1%
Knowledge of environmental impact	83.2%
Knowledge of Safe disposal	85.4%
Reason for low reporting rates	79.3%
Attitude toward Eco-pharmacovigilance	**Agreement (%)**
Improper disposal harms environment	96.9%
Responsibility of PG doctors in EPV	73.3%
Importance of monitoring environmental impact	80.2%
Interest in learning more about EPV	90.8%
Practices related to Drug Disposal	**Percentage (%)**
Returned medicines to collection centres	63.3%
Disposed in household waste	26.5%
Always follow safe disposal practices	9.9%
Never participated in safe disposal	27.7%
Educate patients regularly	26.5%
Attended EPV training/workshop	7.1%

The findings showed that most postgraduate residents had adequate theoretical knowledge regarding eco-pharmacovigilance and environmental safety. However, some residents still

showed moderate or poor knowledge indicating the need for regular educational programs and curriculum-based training. Overall, the residents showed a positive attitude toward eco-pharmacovigilance. Still, a small proportion of residents showed uncertainty or lack of involvement, which may be due to ethical, practical or institutional factors influencing their attitudes toward environmental pharmacology. Despite having adequate knowledge and positive attitudes, the actual implementation of safe disposal practices was still inadequate. The substantial gap between knowledge and practice suggests limited practical exposure, lack of structured training programs, and absence of institutional support systems.

Discussion

The present study demonstrates that postgraduate residents possess relatively high levels of knowledge and positive attitudes toward eco-pharmacovigilance; however, their actual practices remain inadequate. This finding highlights a significant knowledge–practice gap, which has been widely reported in environmental health research [11,12].

The level of knowledge observed in this study (78.2%) is substantially higher than that reported in a recent study conducted among medical students in Bangladesh, where only 27% demonstrated adequate knowledge of eco-pharmacovigilance [13]. This difference may be attributed to the higher clinical exposure and experience among postgraduate residents.

Similarly, the positive attitudes observed in this study are consistent with Wang et al. (2020), where a majority of participants acknowledged the environmental risks associated with pharmaceutical disposal [12]. However, as observed in the present study, despite favourable attitudes, appropriate disposal practices remained unsatisfactory.

The finding that only 9.9% of participants consistently followed safe disposal practices aligns with the study of He et al. (2017) and Bhadoriya et al. (2024) who also found poor compliance despite adequate awareness [10,11]. For instance, Jobin and Prakash (2020) reported that over 80% of participants were unaware of proper disposal methods and practiced unsafe disposal techniques. These observations indicate that awareness alone may not be sufficient to ensure behavioural change [14].

Globally, eco-pharmacovigilance is increasingly being recognized within the broader framework of the “One Health” approach, which emphasizes the interconnection between human, animal, and environmental health. However, implementation remains limited, particularly in low- and middle-income countries [15,16].

There are certain limitations associated with this study like it was a single-centre study with a small sample size, therefore there are chances that the results cannot be generalised. The use of convenience sampling may introduce selection bias, and the reliance on self-reported data may lead to social desirability bias. The inclusion of postgraduate residents enhances the relevance of the findings, as they represent future prescribers and educators.

Overall, the findings of this study highlight the need for structured training programs, institutional policies, and regulatory frameworks to promote environmentally responsible pharmaceutical practices.

Conclusion

The study demonstrates that while postgraduate residents had adequate knowledge and positive attitudes toward eco-pharmacovigilance, their practices regarding safe pharmaceutical disposal remain suboptimal. The significant association between training and safe practices highlights the need for structured educational interventions. Bridging the knowledge–practice gap requires a multifaceted approach involving curriculum integration, institutional support systems, and policy-level changes to ensure environmentally responsible pharmaceutical use and disposal.

References

1. Wilkinson JL, Boxall ABA, Kolpin DW, Leung KM, Lai RWS, Galbán-Malagón C, et al. Pharmaceutical pollution of the world’s rivers. Proc Natl Acad Sci U S A. 2022;119(8):e2113947119. doi:10.1073/pnas.2113947119.
2. Qiu L, Dong Z, Sun H, Li H, Chang CC. Emerging pollutants—Part I: occurrence, fate and transport. Water Environ Res. 2016;88(10):1855–75.
3. Blair BD. Potential upstream strategies for mitigation of pharmaceuticals in the aquatic environment. Curr Environ Health Rep. 2016;3(2):153–60. doi:10.1007/s40572-016-0088-x
4. Bound JP, Voulvoulis N. Household disposal of pharmaceuticals as a pathway for aquatic contamination. Environ Health Perspect. 2005;113(12):1705–11. doi:10.1289/ehp.8315.
5. Tiseo K, Huber L, Gilbert M, Robinson TP, Van Boeckel TP. Global trends in antimicrobial use in food animals from 2017 to 2030. Antibiotics (Basel). 2020;9(12):918. doi:10.3390/antibiotics9120918.
6. Oaks JL, Gilbert M, Virani MZ, Watson RT, Meteyer CU, Rideout BA, et al. Diclofenac residues as the cause of vulture population

decline in Pakistan. Nature. 2004;427:630–3. doi:10.1038/nature02317.
7. Kvarnryd M, Grabic R, Brandt I, Berg C. Early life progestin exposure causes sterility in adult frogs. Aquat Toxicol. 2011;103(1–2):18–24. doi:10.1016/j.aquatox.2011.01.007.
8. Holm G, Snape JR, Murray-Smith R, Talbot J, Taylor D, Sörme P. Implementing ecopharmacovigilance in practice: challenges and opportunities. Drug Saf. 2013;36(7):533–46. doi:10.1007/s40264-013-0043-1.
9. Medhi B, Sewal RK. Ecopharmacovigilance: an issue urgently to be addressed. Indian J Pharmacol. 2012;44(5):547–9. doi:10.4103/0253-7613.100375.
10. He BS, Wang J, Liu J, Hu XM. Eco-pharmacovigilance of non-steroidal anti-inflammatory drugs: necessity and opportunities. Chemosphere. 2017;181:178–89. doi:10.1016/j.chemosphere.2017.04.084.
11. Bhadoriya SS, Wadagbalkar P. Knowledge, attitude and practice of ecopharmacology among healthcare professionals in central India. Int J Basic Clin Pharmacol. 2024;13(1):101–6.
12. Wang J, Li S, He B. Chinese physicians' attitudes toward eco-directed sustainable prescribing: a cross-sectional study. BMJ Open. 2020;10(6):e035502. doi:10.1136/bmjopen-2019-035502.
13. Sonia SB, Chowdhury IH, Nahar K, Fatema SK, Mitu FH, Sultana S, et al. Knowledge, perception, and practices of ecopharmacovigilance among medical students in Bangladesh. INNOSC Theranostics Pharmacol Sci. 2025;8(3):7678.
14. Jobin J, Prakash P. Ecopharmacovigilance: current status and future perspectives. J Pharm Bioallied Sci. 2020;12(3):205–10.
15. Dikshit H, Sharma P. Ecopharmacovigilance: a new direction toward One Health. J Indian Gastrointest Med. 2024;13(1):45–50.
16. Halldin K, Rudén C. Ecopharmacovigilance: ensuring environmental safety from pharmaceuticals. Upps Rep. 2024;92:10–13.