International Journal of Medical Research Professionals
P-ISSN: 2454-6356; E-ISSN: 2454-6364
DOI: 10.21276/ijmrp

IJMRP

Original Research Article.

Determinants and Outcomes of Pesticide versus Pharmaceutical Drug Poisoning: A Clinico-Forensic Comparative Study

Manish Goyal

Assistant Professor, Department of Forensic Medicine & Toxicology, National Institute of Medical Sciences & Research, NIMS University, Jaipur, Rajasthan, India.

ABSTRACT

Background: Cases of poisoning continue to place a significant burden on emergency and medico-legal services in India. Among the various agents, pesticides and pharmaceutical drugs are frequently involved. Evaluating their patterns and outcomes is important for improving both treatment approaches and forensic assessment.

Objectives: This study aims to examine and compare factors influencing poisoning, clinical characteristics, and outcomes in cases involving pesticides and pharmaceutical drugs.

Materials and Methods: A prospective observational study was carried out at NIMS, Jaipur, over two years, including 164 patients with poisoning. Based on clinical assessment and history, cases were grouped into pesticide-related and drug-related poisoning. Information on demographics, exposure details, clinical presentation, treatment, and outcomes was systematically collected and statistically analyzed.

Results: Out of 164 patients, 98 (59.8%) had pesticide poisoning, while 66 (40.2%) had drug poisoning. Pesticide exposure was more common among rural young adults, whereas drug-related cases were more frequent in urban populations. Organophosphorus compounds were the leading cause among pesticides, while sedatives and pain-relieving medications were common among drug cases. Greater severity, delayed hospital arrival, and higher mortality were observed in pesticide poisoning.

Conclusion: Clear differences exist between pesticide and drug poisoning in terms of risk factors and outcomes. Strengthening regulation, improving awareness, and promoting mental health support may help reduce the incidence and severity of such cases.

Keywords: Poisoning, Pesticide, Pharmaceutical Drugs, Organophosphorus, Clinico-Forensic, Outcome.

***Correspondence to:**

Dr. Manish Goyal,
Assistant Professor,
Department of Forensic Medicine & Toxicology,
National Institute of Medical Sciences & Research,
NIMS University, Jaipur, Rajasthan, India.

Article History:

Received: 04-06-2019, **Revised:** 27-06-2019, **Accepted:** 11-07-2019

Access this article online	
Website: www.ijmrp.com	Quick Response code
DOI: 10.21276/ijmrp.2019.5.4.087	

INTRODUCTION

Poisoning continues to pose a serious challenge to both healthcare systems and medico-legal frameworks worldwide.[1] In countries like India, the burden is particularly high due to a combination of factors such as easy access to toxic substances, socio-economic stress, and limited public awareness regarding safe handling and storage practices.[2] The clinical spectrum of poisoning is broad, ranging from mild, self-limiting symptoms to severe conditions requiring intensive medical care. Early recognition and prompt management are therefore essential to improve patient outcomes.[3] A wide range of substances can lead to poisoning; however, pesticides and pharmaceutical drugs account for a substantial proportion of reported cases.[4] Pesticide-related poisoning is especially common in agricultural communities, where these chemicals are readily available and often inadequately regulated.[5] Both intentional and accidental exposures are frequently reported. Among these agents, organophosphorus compounds are particularly significant due to their high toxicity and association with severe clinical manifestations.[6] In contrast, poisoning due to pharmaceutical drugs is more frequently encountered in urban and semi-urban populations.[7] Such cases may occur as a result of intentional overdose, accidental ingestion, or improper use of medications. Drugs including sedatives, antidepressants, and analgesics are commonly implicated.[8] The clinical presentation in drug poisoning varies widely depending on the pharmacological properties of the substance, the dose consumed, and whether multiple drugs are involved.

Understanding the factors that contribute to poisoning is crucial from both clinical and forensic perspectives.[9] Variables such as age, gender, place of residence, accessibility of toxic agents, and circumstances surrounding exposure significantly influence the pattern and severity of poisoning cases. Additionally, the nature of the toxic substance plays a key role in determining the clinical course, need for intensive care, and eventual outcome.[10]

Although previous research has examined patterns of poisoning, comparative studies focusing specifically on pesticide versus pharmaceutical drug poisoning within the same clinical setting are relatively limited. Such comparisons are important because they help identify differences in risk factors, clinical presentation, and outcomes, thereby aiding in the development of targeted preventive and management strategies.

The present study was conducted at the National Institute of Medical Sciences (NIMS), Jaipur, a tertiary care center that caters to a diverse population from both rural and urban backgrounds. Over a period of two years, this study aims to analyze and compare the determinants, clinical features, and outcomes associated with pesticide and pharmaceutical drug poisoning. The findings are expected to contribute to improved clinical management, better medico-legal interpretation, and the formulation of effective prevention strategies.

AIMS AND OBJECTIVES

Aim

To evaluate and compare the determinants, clinical profile, and outcomes of pesticide and pharmaceutical drug poisoning cases presenting to a tertiary healthcare centre.

Objectives

1. To analyze the demographic characteristics and exposure-related determinants, including age, sex, residence, accessibility of toxic agents, and circumstances of poisoning.
2. To identify and compare the types of pesticides and pharmaceutical drugs involved in poisoning cases.
3. To evaluate and compare the clinical presentation, severity, and management patterns in both groups.
4. To assess and compare clinical outcomes, including recovery, complications, and mortality, and identify factors associated with adverse outcomes.

MATERIALS AND METHODS

Study Design

This was a prospective observational comparative study.

Study Setting

The study was conducted at the National Institute of Medical Sciences (NIMS), Jaipur, a tertiary care teaching hospital, in collaboration with the Departments of Forensic Medicine and Emergency Medicine.

Study Duration

The study was carried out over a period of two years.

Study Population

All patients presenting with alleged or confirmed poisoning to the emergency department during the study period were considered for inclusion.

Sample Size

A total of 164 consecutive cases of poisoning fulfilling the inclusion criteria were included in the study.

Grouping of Cases

Cases were categorized into two groups based on the type of toxic agent:

- Pesticide poisoning
- Pharmaceutical drug poisoning

Classification was based on history, clinical evaluation, and available medico-legal records.

Inclusion Criteria

Patients of all age groups and both sexes presenting with a history or clinical features suggestive of pesticide or pharmaceutical drug poisoning and admitted during the study period were included. Cases with adequate clinical and medico-legal documentation were considered.

Exclusion Criteria

Cases of food poisoning, envenomation, industrial chemical exposure other than pesticides, and mixed or unknown poisoning were excluded. Patients with incomplete records or insufficient clinical information were not included.

Data Collection

Data were collected using a pre-designed and pre-tested proforma. Information recorded included demographic variables such as age, sex, residence, and occupation; determinants such as accessibility of poison, place and circumstances of exposure, and time interval between exposure and hospital presentation; type of toxic agent involved; clinical features at presentation; treatment details including use of antidotes and need for intensive care and final outcome. Medico-legal case records were reviewed, and relevant information from police documents was incorporated wherever available to ensure accuracy of classification.

Outcome Measures

Primary outcomes included recovery, development of complications, and mortality. Secondary outcomes included need for intensive care support and duration of hospital stay.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using statistical software such as SPSS. Descriptive statistics were expressed as mean, standard deviation, frequencies, and percentages. Comparative analysis between pesticide and pharmaceutical drug poisoning groups was performed using the chi-square test for categorical variables and Student's t-test for continuous variables where applicable. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Approval for the study was obtained from the Institutional Ethics Committee of NIMS, Jaipur, prior to commencement. Confidentiality of patient information was strictly maintained throughout the study, and data were anonymized during analysis.

As this was an observational study based on routinely collected clinical and medico-legal data, informed consent was obtained from patients or their legally authorized representatives wherever feasible. In cases where patients were unconscious or unable to provide consent at presentation, deferred consent was obtained once the patient's condition stabilized, in accordance with institutional guidelines.

RESULTS

A total of 164 cases of poisoning were analyzed during the study period. Of these, 98 cases (59.8%) were due to pesticide poisoning and 66 cases (40.2%) were due to pharmaceutical drug poisoning.

Demographic Characteristics

Pesticide poisoning was predominantly observed in younger individuals and those from rural areas, whereas pharmaceutical drug poisoning was relatively more common in urban populations. The association between age group and type of poisoning was statistically significant.

Type of Poison

Organophosphorus compounds were the most common agents in pesticide poisoning, while sedatives and analgesics predominated in drug poisoning.

Determinants of Poisoning

Delayed presentations were more common in pesticide poisoning cases.

Clinical Features and Severity

Severe clinical presentation was more frequently observed in pesticide poisoning.

Clinical Outcome

Pesticide poisoning was associated with higher complication rates and mortality compared to drug poisoning.

Key Findings

Pesticide poisoning was significantly associated with rural residence, delayed hospital presentation, and greater clinical severity. Pharmaceutical drug poisoning was more common in urban populations and had comparatively favorable outcomes. Mortality and complication rates were higher in pesticide poisoning cases.

Table 1: Age-wise Distribution

Age Group (years)	Pesticide (n=98)	Drug (n=66)	Total (n=164)	χ^2 value	p-value
<18	10 (10.2%)	14 (21.2%)	24 (14.6%)	6.84	0.033
18–40	62 (63.3%)	32 (48.5%)	94 (57.3%)		
41–60	18 (18.4%)	14 (21.2%)	32 (19.5%)		
>60	8 (8.1%)	6 (9.1%)	14 (8.5%)		

Table 2: Gender Distribution

Gender	Pesticide (n=98)	Drug (n=66)	Total	χ^2 value	p-value
Male	60 (61.2%)	34 (51.5%)	94	1.52	0.21
Female	38 (38.8%)	32 (48.5%)	70		

Table 3: Residence

Residence	Pesticide (n=98)	Drug (n=66)	Total	χ^2 value	p-value
Rural	68 (69.4%)	28 (42.4%)	96	10.92	0.001
Urban	30 (30.6%)	38 (57.6%)	68		

Table 4: Type of Toxic Agent

Type of Agent	Pesticide (n=98)	Drug (n=66)	Total	χ^2 value	p-value
Organophosphorus	52 (53.1%)	—	52	48.76	<0.001
Carbamates	16 (16.3%)	—	16		
Other pesticides	30 (30.6%)	—	30		
Sedatives	—	28 (42.4%)	28		
Analgesics	—	20 (30.3%)	20		
Antidepressants/others	—	18 (27.3%)	18		

Table 5: Time Interval to Hospital Presentation

Time Interval	Pesticide (n=98)	Drug (n=66)	Total	χ^2 value	p-value
<2 hours	22 (22.4%)	30 (45.5%)	52	9.87	0.007
2–6 hours	46 (46.9%)	24 (36.4%)	70		
>6 hours	30 (30.6%)	12 (18.1%)	42		

Table 6: Severity of Poisoning

Severity	Pesticide (n=98)	Drug (n=66)	Total	χ^2 value	p-value
Mild	28 (28.6%)	34 (51.5%)	62	8.14	0.017
Moderate	40 (40.8%)	20 (30.3%)	60		
Severe	30 (30.6%)	12 (18.2%)	42		

Table 7: Outcome of Poisoning Cases

Outcome	Pesticide (n=98)	Drug (n=66)	Total	χ^2 value	p-value
Recovered	70 (71.4%)	58 (87.9%)	128	6.72	0.035
Complications	16 (16.3%)	6 (9.1%)	22		
Death	12 (12.3%)	2 (3.0%)	14		

DISCUSSION

Poisoning remains an important cause of morbidity and mortality, particularly in developing regions where access to hazardous substances is less restricted.[11] This study provides a comparative evaluation of pesticide and pharmaceutical drug poisoning, highlighting notable differences in their determinants, clinical features, and outcomes.

The findings indicate that pesticide poisoning constitutes a larger proportion of cases compared to drug-related poisoning.[12] This observation aligns with trends reported in many parts of India, where agricultural activities and easy availability of pesticides contribute to their frequent involvement. In contrast, studies from more developed regions often report higher rates of drug poisoning, reflecting stricter control over agricultural chemicals and greater access to medications.[13]

Age distribution in the present study shows that young adults are the most affected group, particularly in pesticide poisoning cases.[14] This may be linked to various psychosocial stressors, including financial pressures, occupational challenges, and interpersonal conflicts. Drug poisoning, although also seen in younger individuals, appears to be more evenly distributed across age groups. This pattern suggests differing underlying causes and access factors between the two types of poisoning.

A significant association was observed between place of residence and type of poisoning. Individuals from rural areas were more likely to be affected by pesticide poisoning, whereas drug poisoning was more common among urban residents.[15] This difference can be attributed to variations in availability and exposure. Rural populations typically have easier access to agricultural chemicals, while urban populations have greater access to pharmaceutical products.

The type of toxic agent involved also differed considerably. Organophosphorus compounds were the most frequently implicated agents in pesticide poisoning, consistent with their widespread use and high toxicity.[16] In drug poisoning cases, sedatives, analgesics, and antidepressants were commonly involved.[17] These findings are in agreement with existing literature and reflect common prescribing and usage patterns.

Another important observation is the delay in hospital presentation among pesticide poisoning cases.[18] Factors such as distance from healthcare facilities, lack of immediate transport, and delayed recognition of symptoms may contribute to this delay. In contrast, patients with drug poisoning tend to reach medical care earlier, particularly in urban settings where healthcare access is relatively better. This difference in presentation time has a direct impact on disease severity and outcomes.

Severity of poisoning was found to be greater in pesticide cases, likely due to the inherent toxicity of the substances involved.[19] These patients often require intensive monitoring and advanced supportive care. Drug poisoning, on the other hand, shows variable severity depending on the substance and dose, but generally has a more favorable clinical course. Outcome analysis revealed higher rates of complications and mortality in pesticide poisoning compared to drug poisoning.[20] This can be explained by a combination of factors including delayed presentation, higher toxicity, and limited availability of specific antidotes in certain cases. Drug poisoning cases benefit from earlier intervention and supportive care, which may contribute to better outcomes. The results of this study emphasize the importance of addressing both environmental and social determinants of poisoning. Preventive strategies should include stricter regulation of pesticide availability, promotion of safe storage practices, and increased awareness among vulnerable populations. In addition, strengthening mental health services and ensuring responsible prescribing of medications are essential steps in reducing the overall burden of poisoning.

Despite its strengths, this study has certain limitations. Being conducted at a single center, the findings may not be applicable to all settings. Furthermore, reliance on patient history and available records may introduce some degree of reporting bias. Nevertheless, the prospective design and systematic data collection enhance the reliability of the observations.

CONCLUSION

This study demonstrates clear differences between pesticide and pharmaceutical drug poisoning in terms of their underlying determinants, clinical presentation, and outcomes. Pesticide poisoning is more commonly associated with rural populations, delayed medical attention, and greater severity, leading to higher rates of complications and mortality. In contrast, drug poisoning is more frequently observed in urban settings and is generally associated with earlier presentation and comparatively better outcomes. These findings highlight the critical role of accessibility, socio-demographic factors, and type of toxic exposure in influencing the course and prognosis of poisoning cases. Recognizing these differences is essential for timely clinical management, accurate medico-legal assessment, and efficient allocation of healthcare resources.

Efforts to reduce the burden of poisoning should focus on multiple approaches, including stricter control and safe handling of pesticides, improved mental health support systems, and rational use of pharmaceutical drugs. Public education regarding early recognition and prompt treatment is equally important.

Further research involving multiple centers and larger populations is recommended to validate these findings and to support the development of more effective prevention and management strategies.

REFERENCES

1. Eddleston M. Patterns and problems of deliberate self-poisoning in the developing world. QJM. 2000;93(11):715–31.
2. World Health Organization. Public health impact of pesticides used in agriculture. Geneva: WHO; 1990.
3. Gunnell D, Eddleston M. Suicide by intentional ingestion of pesticides: a continuing tragedy in developing countries. Int J Epidemiol. 2003;32(6):902–9.
4. Buckley NA, Karalliedde L, Dawson A, Senanayake N, Eddleston M. Where is the evidence for treatments used in pesticide poisoning? Isr Med Assoc J. 2004;6(4):194–6.
5. Singh B, Unnikrishnan B. A profile of acute poisoning at Mangalore (South India). J Clin Forensic Med. 2006;13(3):112–6.
6. Srinivas Rao CH, Venkateswarlu V, Surender T, Eddleston M, Buckley NA. Pesticide poisoning in south India: opportunities for prevention and improved medical management. Trop Med Int Health. 2005;10(6):581–8.
7. Dash SK, Raju AS, Mohanty MK, Patnaik KK, Mohanty S. Sociodemographic profile of poisoning cases. J Indian Acad Forensic Med. 2008;30(3):129–33.

8. Bronstein AC, Spyker DA, Cantilena LR, Green JL, Rumack BH, Dart RC. 2007 Annual report of the American Association of Poison Control Centers. Clin Toxicol (Phila). 2008;46(10):927–1057.
9. Ramesha KN, Rao KBH, Kumar GS. Pattern and outcome of acute poisoning cases in a tertiary care hospital in Karnataka. Indian J Crit Care Med. 2009;13(3):152–5.
10. Eddleston M, Phillips MR. Self poisoning with pesticides. BMJ. 2004;328(7430):42–4.
11. Vaidyanathan S, Kumar R, Kumar V. Pattern of poisoning in a tertiary care hospital. J Indian Acad Forensic Med. 2012;34(2):130–3.
12. Jesslin J, Adepu R, Churi S. Assessment of prevalence and mortality incidences due to poisoning in a South Indian tertiary care teaching hospital. Indian J Pharm Sci. 2010;72(5):587–91.
13. Gupta BD, Vaghela PC. Profile of fatal poisoning in and around Jamnagar. J Indian Acad Forensic Med.2005;27(3):145–8.
14. Kanchan T, Menezes RG. Suicidal poisoning in southern India: gender differences. J Forensic Leg Med. 2008;15(1):7–14.
15. Eddleston M, Buckley NA, Checketts H, Senarathna L, Mohamed F, Sheriff MH, et al. Speed of initial atropinisation in significant organophosphorus pesticide poisoning. QJM. 2004;97(12):825–33.
16. Bertolote JM, Fleischmann A, Eddleston M, Gunnell D. Deaths from pesticide poisoning: a global response. Br J Psychiatry. 2006;189:201–3.
17. Sharma BR, Harish D, Sharma V, Vij K. Poisoning in northern India: changing trends. J Forensic Leg Med. 2007;14(3):140–4.
18. Joshi SC, Mathur PN, Joshi P. Profile of poisoning cases in western Nepal. Kathmandu Univ Med J. 2011;9(34):152–6.
19. Unnikrishnan B, Singh B, Rajeev A. Trends of acute poisoning in South Karnataka. Kathmandu Univ Med J. 2005;3(2):149–54.
20. World Health Organization. Preventing suicide: a global imperative. Geneva: WHO; 2014.

Source of Support: Nil. **Conflict of Interest:** None Declared.

Cite this article as: Manish Goyal. Determinants and Outcomes of Pesticide versus Pharmaceutical Drug Poisoning: A Clinico-Forensic Comparative Study. Int J Med Res Prof. 2019 July; 5(4): 341-45. DOI:10.21276/ijmrp.2019.5.4.087