

ORIGINAL ARTICLE

A study of Patterns, Toxic Agent and Contributing Factors in Death due to Poisoning

DOI: 10.5281/zenodo.17909349


Farzana Ahmed¹, Laila Yesmin², Jinat Mustary Liza³, Farhana Zahan Jolly⁴

Received: 24 Nov 2025

Accepted: 04 Dec 2025

Published: 12 Dec 2025

Published by:

Gopalganj Medical College, Gopalganj, Bangladesh

Correspondence to

Farzana Ahmed

ORCID

<https://orcid.org/0009-0007-3141-1573>

Copyright © 2025 The Insight



This article is licensed under a Creative Commons Attribution 4.0 International License.



ABSTRACT

Background: Poisoning is a significant cause of morbidity and mortality worldwide, with young adults in developing countries disproportionately affected. In Bangladesh, pesticides and household chemicals are major contributors to poisoning-related deaths, yet region-specific data on patterns, toxic agents, and precipitating factors remain limited. **Aim of the study:** To evaluate the demographic patterns, toxic agents, and contributing psychosocial factors associated with poisoning-related deaths in Bangladesh to inform preventive strategies and improve clinical management. **Methods & Materials:** A retrospective study, conducted in 126 cases, data were collected from a predesigned format of autopsy reports, hospital notes and inquest reports all performed at Dhaka Medical College (DMC) Morgue during the year of January'2024 to June 2024. The data received were carefully recorded later, analyzed by computer and organized in tables. **Result:** Young adults (21–30 years) were the most affected group (30.16%), with a slight female predominance (53.97%). Housewives (27.78%) and farmers (23.81%) were the most vulnerable occupational groups. Organophosphorus compounds were the leading toxic agents (44.44%), followed by aluminum phosphide (20.63%) and zinc phosphide (14.29%). Familial disharmony/domestic conflict (31.75%), failure in personal affairs (15.87%), and examination failure (14.29%) were the primary precipitating factors. **Conclusion:** Poisoning-related deaths in Bangladesh predominantly affect young adults, with pesticides as the major toxic agents and psychosocial stressors as key triggers. Targeted public health interventions, regulation of hazardous chemicals, and mental health support are essential to reduce poisoning-related morbidity and mortality.

Keywords: Poisoning, Mortality, Organophosphorus, Aluminum phosphide, Psychosocial factors, Bangladesh

(The Insight 2025; 8(3): 525-528)

1. Associate Professor, Department of Forensic Medicine & Toxicology, US-Bangla Medical College and Hospital, Rupgonj, Narayanganj, Dhaka
2. Professor of Forensic Medicine and Toxicology, Khwaza Yunus Ali Medical College and Hospital, Sirajganj
3. Associate Professor, Department of Forensic Medicine & toxicology, Ibrahim Medical College, Dhaka
4. Associate professor Department of forensic medicine & toxicology, Dr. Sirajul Islam Medical College

INTRODUCTION

Poisoning is a qualitative concept that refers to exposure to any chemical substance capable of causing harmful or adverse effects on the body, potentially disrupting normal biological functions and resulting in effects that range from mild harm to severe or life-threatening outcomes [1,2]. Annually, more than 385 million cases of accidental acute pesticide poisoning are reported globally, leading to about 11,000 deaths. With an estimated 860 million people engaged in farming worldwide, roughly 44% of farmers experience pesticide poisoning each year [3]. The mortality rate from pesticide poisoning is reported to be 14–15% in developing countries, compared to less than 1% in developed nations [4]. In Bangladesh, poisoning accounts for around 10–15% of medico-legal deaths, predominantly affecting young adults, with organophosphorus and organochlorine pesticides responsible for over 50% of cases, highlighting a major public health concern [5]. The prevalence of poisoning in a region is influenced by multiple factors, such as the accessibility and availability of toxic substances, socio-economic conditions,

and cultural or religious practices. Acute poisoning represents a significant medical emergency. The types of poisons used differ across regions worldwide and can even vary within the same country due to socio-economic and cultural differences. Intentional self-poisoning is responsible for approximately one-third of global suicides [6]. In children, poisoning primarily arises from exposure to drugs, hydrocarbons bleaching agents, detergents, disinfectants, plant pesticides, insecticides, cosmetics, alcohol, and narcotics; however, over 75% of cases result from ingestion of toxic substances [7]. Diagnosing acute intoxication in older adults presents significant clinical challenges due to several factors. First, it is often difficult to determine whether the patient has been exposed to a toxic dose or has experienced an overdose. Second, pre-existing medical conditions, which are common in the elderly, may obscure or mask the clinical signs and symptoms of poisoning, making accurate diagnosis more complicated. Finally, the manifestations of toxic exposure often resemble or overlap with common age-related health problems, further complicating timely recognition and appropriate management

[8,9]. Potential risk factors for suicidal poisoning include low socioeconomic status, rural residence, easy access to household insecticides, school dropout, gender inequality, family stress, inadequate supervision, adolescent challenges, and psychiatric disorders. In children, additional triggers may involve conflicts with parents or siblings, romantic disappointments, academic failure, and disputes with peers [10]. Additionally, the incidence of poisoning is influenced by factors such as the availability of toxic substances, socioeconomic conditions, cultural and religious practices, and the common occupations within a region [11]. Poisoning remains a significant public health concern globally and in Bangladesh, affecting all age groups, with pesticides and household chemicals as the predominant agents. Socioeconomic, cultural, and occupational factors, along with age-specific vulnerabilities, influence both incidence and outcomes. Despite its high morbidity and mortality, region-specific data on patterns, toxic agents, and contributing factors remain limited. So, this study aims to evaluate the patterns, common toxic agents, and associated risk factors of poisoning cases, to inform preventive strategies and improve clinical management in the Bangladeshi context.

METHODS & MATERIALS

A retrospective study, conducted in 126 death cases of poisoning, data were collected from a predesigned format of autopsy reports, hospital notes and inquest reports all performed at Dhaka Medical College (DMC) Morgue during the year of January 2024 to June 2024. The data received were carefully recorded later, analyzed by computer and organized in tables.

RESULT

The majority of individuals were young adults, with the 21–30-year age group comprising 30.16% of cases (Table I). This was followed by the 31–40-year group 22.22% of cases and the 11–20-year group 17.46% of cases. Individuals aged 41–50 years represented 15.87% of cases, whereas those older than 50 years accounted for 9.52% of cases. The smallest proportion was observed among children aged 0–10 years 4.76% of cases. Regarding gender distribution, females slightly predominated with 53.97%, compared to 46.03% males. Table II indicated that housewives were the most affected group, representing 27.78% of cases, closely followed by farmers 23.81% of cases. Students and day laborers each accounted for 15.87% of cases, while businessmen contributed 7.94% of cases. The remaining 8.73% of cases were categorized under other occupations. Organophosphorus compounds were the predominant poisons, identified in 44.44% of cases (Table III). Aluminum phosphide was the second most common agent, detected in 20.63% of cases, followed by zinc phosphide 14.29% of cases. Corrosive substances, including acids and alkalis, were found in 9.52% of cases, while methyl alcohol and drugs such as paracetamol and barbiturates were detected in 6.35% and 4.76% of cases respectively. Table IV demonstrated that familial disharmony or domestic trouble was the leading factor, accounting for 31.75% of cases. Other notable causes included failure in affairs 15.87% of cases, failure in examinations 14.29% of cases, and poverty 11.90% of cases. Sexual abuse was reported in 6.35% of cases, while 19.84% of cases were attributed to other reasons.

Table – I: Demographic profile of the study population (n= 126)

Variables	Number (n)	Percentage (%)
Age in years		
0–10	6	4.76
11–20	22	17.46
21–30	38	30.16
31–40	28	22.22
41–50	20	15.87
>50	12	9.52
Gender		
Male	58	46.03
Female	68	53.97

Table – II: Occupational Profile of Poison-Related Deaths (n= 126)

Variables	Number (n)	Percentage (%)
Occupation		
Farmers	30	23.81
Housewives	35	27.78
Students	20	15.87
Businessmen	10	7.94
Day laborers	20	15.87
Others	11	8.73

Table – III: Types of detected poisons compounds in the study population (n= 126)

Type of Poison	Number (n)	Percentage (%)
Organo Phosphorus Compound	56	44.44
Aluminum Phosphide	26	20.63
Zinc Phosphide	18	14.29
Corrosives (Acid/Alkali)	12	9.52
Methyl Alcohol	8	6.35
Drugs (Paracetamol, Barbiturate)	6	4.76

Table – IV: Causes behind poisoning in the study population (n=126)

Cause of Poisoning	Number (n)	Percentage (%)
Familial Disharmony / Domestic Trouble	40	31.75
Poverty	15	11.90
Failure in Affairs	20	15.87
Failure in the Examination	18	14.29
Sexual Abuse	8	6.35
Others	25	19.84

DISCUSSION

Poisoning-related deaths encompass a broad spectrum of circumstances, ranging from accidental and occupational exposures to intentional self-harm and homicidal acts [6]. The largest age-group affected was 21–30 years 30.16% of cases, followed by 31–40 years 22.22% of cases and 11–20 years 17.46% of cases. There was a slight female predominance, with females accounting for 53.97% of cases compared to 46.03% males. Dewan et al. reported that males accounted for 60.30% of cases, while females comprised 39.70% of cases. The highest number of patients were in the 21–30 years age group 38.10% of cases, followed by those under 20 years 33.80% of cases. These findings indicate that adolescents and young adults represent the most vulnerable population to this type of poisoning in the country [12]. Acherjya et al. reported a

mean age of 27±11 years (SD) with a slight female predominance in acute poisoning cases (females 52%, males 48%), which is similar to the findings of our study [13]. Bhattacharjee et al. assessed that 43% were male and 57% were female. The majority of patients (85%) were young, aged below 30 years. The mean age of male patients was 26.2 years, while that of female patients was 21.7 years [14]. In our study, housewives comprised 27.78% of cases and farmers 23.81% of cases. Similarly, Nahida et al. assessed that housewives constituted the largest group (32.53%), followed by agricultural workers (15.67%), students (15.66%), and businessmen (15.66%). Service holders, drivers, and other occupations accounted for 7.23%, 4.82%, and 8.43% of cases, respectively [15]. Debnath et al. reported that agricultural workers accounted for the highest proportion of cases (51.91%), followed by housewives (28.68%) and laborers (12.29%) [16]. The most frequently identified toxin was organophosphorus compounds at 44.44%, followed by aluminum phosphide (20.63%) and zinc phosphide (14.29%). Similarly, Khan et al. stated that Organophosphorus compound poisoning was the most common, accounting for 63.90% of cases, followed by benzodiazepine poisoning (6.80%) [17]. Paudyal et al. reported that organophosphorus compounds (42.00%), drugs (25.00%), and zinc phosphide (6.50%) were the most common agents involved in poisoning cases, both in the total and adult populations [18]. Dewan et al. stated that organophosphate compounds were the predominant agents, accounting for 89.80% of cases, followed by rodenticides (4.30%), carbamates (4.00%), unknown compounds (1.60%), and pyrethroids (0.30%) [12]. The most common precipitating factor for poisoning was familial disharmony or domestic conflict (31.75%), followed by failure of personal affairs (15.87%), failure in examinations (14.29%), poverty (11.90%), sexual abuse (6.35%), and other causes (19.84%) Hosen et al. reported that familial disharmony (38.30%) and quarrels with other family members (37.50%) were the predominant causes of poisoning, followed by failure in personal affairs (15.00%) and other reasons (9.20%) [19]. Hossain et al. assessed that familial disharmony was the leading cause of poisoning (45.00%), followed by failure in love affairs (27.00%), misunderstanding with parents (10.00%), education-related stress (7.00%), extramarital relationships (4.00%), and unknown causes (4.00%) [20]. Similarly, Howlader et al. reported that the majority of poisoning cases were attributed to familial disharmony or domestic conflict (57.00%), followed by poverty (23.00%), failure in romantic relationships (15.00%), failure in examinations (11.00%), sexual abuse (4.00%), and chronic illness or unknown causes (5.00%) [21].

Limitations of the study: This study was limited by its retrospective design, relying solely on available autopsy and hospital records, which may have led to incomplete or missing data. The sample was confined to a single tertiary care center in Dhaka, limiting the generalizability of findings to other regions. Toxicological analyses were dependent on the substances tested and available laboratory methods, potentially overlooking emerging or uncommon poisons. Additionally, psychosocial factors were assessed from documented histories, which may not fully capture the complexity of underlying causes.

CONCLUSION

This study highlights that poisoning-related deaths in Bangladesh predominantly affect young adults, with a slight

female predominance. Housewives and farmers were the most vulnerable occupational groups. Organophosphorus compounds emerged as the leading toxic agents, followed by aluminum and zinc phosphide, while corrosives, methyl alcohol, and drug overdoses contributed to a smaller proportion of cases. Familial disharmony, domestic conflicts, and personal failures were the major precipitating factors, underscoring the interplay of psychosocial stressors with access to toxic substances. These findings emphasize the urgent need for targeted public health interventions, stricter regulation of hazardous chemicals, and the development of preventive strategies and mental health support to reduce poisoning-related morbidity and mortality in the region.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee.

REFERENCES

1. Pokhrel D, Pant S, Pradhan A, Mansoor S. A comparative retrospective study of poisoning cases in central, zonal and district hospitals. *Kathmandu University Journal of Science Engineering and Technology*. 2008 Sep 1;4(1).
2. Chandravanshi LP, Pal M. Assessment and diagnosis of poisoning with characteristics features in living or dead. *Journal of Forensic Sciences & Criminal Investigation*. 2018;10(5):1-2.
3. Boedeker W, Watts M, Clausen P, Marquez E. RETRACTED ARTICLE: The global distribution of acute unintentional pesticide poisoning: estimations based on a systematic review. *BMC public health*. 2020 Dec 7;20(1):1875.
4. Islam MR, Biswas S, Hossain SZ, Islam N, Dewan G, Robed Amin M. Pattern and risk factors of acute poisoning in a tertiary hospital of Central Bangladesh. *Journal of Emergency practice and Trauma*. 2019 Jan 1;5(1):23-8.
5. Islam MN, Islam N. Retrospective study of 273 deaths due to poisoning at Sir Salimullah Medical College from 1988 to 1997. *Legal medicine*. 2003 Mar 1;5:S129-31.
6. Ahmed MB, Haile M, Tegene E. Prevalence and patterns of poisoning cases among patients presented to Jimma University specialized hospital: A five years retrospective data analysis. *J Clin Toxicol*. 2018;8(372):2161-0495.
7. Fan AY, CHE LA, Pan B, Yang C, Coulter CV, Shieffelbien L, Temple W, Braund R. Investigating childhood and adolescence poisoning exposures in New Zealand reported to the national poisons centre during 2000-2009.
8. Yang CC. Acute poisoning in the elderly: an increasingly recognized but still overlooked problem. *Journal of the Chinese Medical Association*. 2010 Apr 1;73(4):183-5.
9. Zanaty AW, Elagamy SE. Retrospective study of acute poisoning in elderly cases admitted to Menoufia Poisoning Control Center (MPCC), Menoufia University Hospitals from 2012 to 2014. *The Egyptian Journal of Forensic Sciences and Applied Toxicology*. 2016 Dec 1;16(Supplement):113-40.
10. Naik IB, Vankayala H, Sailaja A, Kumari NG, Babjan S, Kumar PD. Clinical Profile, Socio Demographic Factors and Outcome of Children Presenting with Poisoning or Intoxication, A Hospital Based Study. *European Journal of Cardiovascular Medicine*. 2024 May 7;14:158-68.
11. Gupta P, Kumar A, Singh SP, Prakash M, Gupta M, Kumar P. Pattern of cases of acute poisoning in a rural tertiary care center in Northern India. *National Journal of Community Medicine*. 2016 Apr 30;7(4):307-10.
12. Dewan G. Analysis of recent situation of pesticide poisoning in Bangladesh: is there a proper estimate?

13. Acherjya GK, Ali M, Alam AB, Rahman MM, Mowla SG. The scenario of acute poisoning in Jashore, Bangladesh. *Journal of Toxicology*. 2020;2020(1):2109673.
14. Bhattacharjee B, Roy S, Alam MJ, Royle RK, Paul S, Islam MS, Bari MS, Chowdhury FR, Alam MM, Chowdhury FR. Psychosocial factors behind deliberate self-poisoning in a tertiary care hospital of Bangladesh: a cross-sectional study. *Cureus*. 2023 Jun 2;15(6).
15. Nahida NN, Rahman MZ, Ahamed BU. Organophosphorus Compound as Suicidal Poison in Rural Areas of Bangladesh: A Medicolegal Study. *Journal of Monno Medical College*. 2023 Nov 6;9(1):7-10.
16. Debnath J, Basak AK, Rahman MZ, Saha A. Profile of Organophosphorus Poisoning. *KYAMC Journal*. 2018 Dec 4;9(3):133-5.
17. Khan NA, Rahman A, Sumon SM, Haque MF, Hasan I, Sutradhar SR, Barman TK, Rahman S, Ferdous J, Miah AH, Alam MK. Pattern of poisoning in a tertiary level hospital. *Mymensingh Medical Journal: MMJ*. 2013 Apr 1;22(2):241-7.
18. Paudyal BP. Poisoning: pattern and profile of admitted cases in a hospital in central Nepal. *JNMA J Nepal Med Assoc*. 2005 Jul 1;44(159):92-6.
19. Hosen MA, Faysal MM, Khanam J, Khan B, Ahamed F, Khan ME. Clinical Profile and Outcome of Organophosphorus Poisoning in a Tertiary Hospital. *Mymensingh Medical Journal: MMJ*. 2024 Apr 1;33(2):509-15.
20. Hossain SM, Kabir F, Kamal SM, Islam N. Cause and outcome of poisoning among admitted patients in a teaching hospital. *Bangladesh Medical Journal Khulna*. 2019;52(1-2):30-4.
21. Howlader MA, Hossain MZ, Morshed MG, Begum H, Sardar MH, Uddin MZ, Azad KA. Changing trends of poisoning in Bangladesh. *Journal of Dhaka Medical College*. 2011;20(1):51-6.