

Original Article

Sociodemographic Profile and Severity Evaluation in Organophosphorus Poisoning Cases

DOI: dx.doi.org

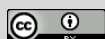


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Received: 24 Jan 2024
Accepted: 26 Jan 2024
Published: 28 Feb 2024

Published by:
Sher-E-Bangla Medical College,
Barishal, Bangladesh

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ABSTRACT

Background: Organophosphorus (OP) compounds, extensively used in agricultural practices, constitute a leading cause of both accidental and intentional poisoning in low- and middle-income countries. Despite advancements in clinical management, OP poisoning remains associated with high morbidity and mortality, particularly in rural populations with limited access to timely care. **Aim of the study:** This study aimed to evaluate the sociodemographic distribution and clinical severity of patients presenting with OP poisoning, using validated severity scales and outcome parameters to inform prevention strategies and enhance emergency response protocols. **Methods & Materials:** A cross-sectional observational study was conducted within one year period at Dhaka Medical College Hospital, in Dhaka Bangladesh. A total of 213 patients with confirmed OP poisoning were enrolled. Sociodemographic variables, exposure characteristics, clinical manifestations, and outcomes were systematically documented. Severity was graded using the Peradeniya Organophosphorus Poisoning (POP) scale. Data analysis was performed using SPSS version 26.0, and associations between clinical variables and outcomes were tested using the Chi-square test, with statistical significance set at $p < 0.05$. **Result:** The mean age of the cohort was 34.32 ± 8.20 years, with the majority aged 31–40 years (36.62%). Females (59.62%) and rural residents (83.10%) predominated. The most affected occupational group was housewives (47.89%). Suicidal ingestion accounted for 83.57% of exposures, and oral intake was the most common route. Respiratory distress, miosis, and bradycardia were the most prevalent clinical features. Mechanical ventilation was required in 22.54% of cases. Respiratory failure (59.62%) and aspiration pneumonia (18.78%) were the most frequent complications. Family conflict (28.64%) and financial stress (23.94%) were the leading self-reported motivations behind poisoning. **Conclusion:** Organophosphorus poisoning in Bangladesh disproportionately affects young adult females from rural settings, primarily due to intentional ingestion linked to psychosocial stressors. The clinical burden is compounded by delayed presentations and the need for intensive care in a subset of patients. Targeted public health interventions, including mental health support and community-based pesticide regulation, are imperative to reduce incidence and improve outcomes.

Keywords: Organophosphorus poisoning, sociodemographic profile, POP scale, pesticide ingestion, clinical severity, rural health, Bangladesh.

(The Planet 2024; 8(1): 223-227)

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INTRODUCTION

Organophosphorus (OP) compounds, widely utilized as insecticides in agricultural practices, represent a common cause of poisoning worldwide due to their broad availability and potent cholinergic toxicity^[1]. Globally, the World Health Organization estimates that OP compounds are responsible for approximately 3 million cases of poisoning and over 200,000 deaths annually, with a significant proportion attributed to deliberate self-harm^[2]. In Bangladesh, OP poisoning is a frequent cause of toxic exposure in emergency departments, accounting for up to 70% of all acute poisoning cases according to national toxicological surveys^[3]. These

compounds inhibit acetylcholinesterase, leading to an accumulation of acetylcholine at synaptic junctions and resulting in a range of clinical manifestations, from muscarinic and nicotinic symptoms to central nervous system disturbances^[4]. Acute presentations of toxicity may include symptoms such as excessive salivation, lacrimation, urination, diarrhea, gastrointestinal cramps, and emesis, commonly referred to as SLUDGE syndrome. In addition, affected individuals may experience fasciculations, bradycardia, hypotension, and, in more severe cases, seizures and respiratory failure^[5]. Clinical assessment tools such as the Peradeniya Organophosphorus Poisoning (POP) scale and

measurement of serum cholinesterase levels are frequently employed to assess severity and guide management strategies^[6]. Prompt recognition and timely administration of atropine and oximes remain the mainstay of treatment, supported by ventilatory assistance in critical cases^[7,8]. In addition to the medical considerations, OP poisoning is closely linked to various sociodemographic factors^[9]. Young adults, in particular, are disproportionately affected by OP poisoning, often as a result of psychological stressors, familial conflicts, or financial instability, which may contribute to the higher incidence of exposure in this demographic group^[10]. Socioeconomic status, education level, and urban–rural residence significantly influences both the risk of exposure and the likelihood of early hospital presentation^[11]. Furthermore, patterns of OP poisoning differ based on gender roles and occupational exposures; men frequently encounter these toxins in occupational settings, while women are often exposed in the context of domestic environments or intentional ingestion^[12,13]. Mental health plays a pivotal role, with depressive symptoms, lack of social support, and poor access to psychiatric care contributing to the decision to ingest pesticides as a means of self-harm^[14]. Proper identification of these sociodemographic risk factors is essential for the development of preventive measures, particularly in resource-limited settings where early intervention can significantly impact prognosis^[15]. Despite the availability of clinical guidelines for OP poisoning management, delays in treatment, lack of awareness, and variable clinical responses continue to complicate outcomes^[16]. Therefore, a detailed analysis of sociodemographic characteristics alongside severity grading at presentation is critical for refining treatment protocols, identifying high-risk groups, and optimizing resource allocation within emergency care frameworks. This study is aimed at addressing these gaps by systematically evaluating the sociodemographic background and clinical severity of patients presenting with OP poisoning, with the ultimate goal of improving both preventive and therapeutic strategies in high-risk populations.

METHODOLOGY & MATERIALS

This cross-sectional observational study was conducted at the Department of Forensic Medicine and Toxicology, in Dhaka Medical College Hospital, Dhaka Bangladesh within 1 year period from March 2023 to March 2024. A total of 213 patients presenting to the casualty services with a history or clinical features suggestive of organophosphorus (OP) poisoning were included in the study. All cases were assessed in accordance with the study objectives to explore the sociodemographic characteristics and clinical outcomes associated with OP poisoning.

Inclusion Criteria

- Patients presenting with clinical features consistent with organophosphorus compound poisoning
- Patients with a clear history of exposure to OP compounds

Exclusion Criteria

- Cases inconsistent with OP poisoning upon clinical or toxicological evaluation
- Patients with incomplete medical records or unclear exposure history

Ethical Considerations

Informed consent was obtained from all patients prior to their inclusion in the study. All data were collected using a pre-structured proforma and were handled with strict confidentiality. The information gathered was used solely for analysis related to this research on organophosphorus poisoning cases. Ethical clearance for the study was obtained from the Institutional Review Board of Dhaka Medical College Hospital.

Data Collection

Clinical and sociodemographic data were collected using a pre-structured proforma. Detailed information on patient age, sex, occupation, type of poison consumed, time of ingestion, time elapsed before hospital presentation, and duration of hospital stay was recorded. Seasonal variations in OP poisoning, manner of poisoning (accidental or intentional), and mortality outcomes were also documented. The severity of poisoning was assessed using the Peradeniya Organophosphorus Poisoning (POP) scale, a validated clinical tool based on presenting neurological and systemic features. Due to the unavailability of biochemical kits, quantitative estimation of red blood cell cholinesterase and plasma pseudocholinesterase levels could not be performed.

Statistical Analysis

All collected data were entered into a computerized database and analyzed using IBM SPSS Statistics software, version 26.0. Descriptive statistics, including mean, standard deviation, and proportions, were used to summarize baseline characteristics. The Chi-square test was employed to assess the association between clinical variables such as lag time and mortality. A p-value of less than 0.05 was considered statistically significant.

RESULT

The study included 213 patients diagnosed with organophosphorus poisoning. The mean age was 34.32±8.20 years, with the highest proportion in the 31–40-year age group (36.62%), surveyed by 21–30 years (31.46%). Individuals over 40 years comprised 27.70%, whereas those aged ≤20 years accounted for only 4.23%. Females were more commonly affected, comprising 59.62% of cases, whereas males made up 40.38%. Regarding marital status, 53.05% were married, 38.97% were unmarried, and 7.98% were either divorced or widowed. Occupational distribution showed that housewives were the most affected group (47.89%), followed by farmers (24.88%). Students made up 7.04%, laborers 5.63%, and unemployed individuals 1.88%. The remaining 12.68% fell into miscellaneous categories, such as shopkeepers or service holders. Most patients (83.10%) resided in rural areas (Table I). Table II demonstrated the context and mode of poisoning. Suicidal ingestion was

predominant, accounting for 83.57% of the cases, though 16.43% resulted from accidental exposure. There were no cases with homicidal intent. Oral ingestion was the most frequent route (83.57%), monitored by inhalation (12.21%) and dermal exposure (4.23%). Prehospital decontamination was performed in 73.71% of cases, even though 26.29% received no such intervention before hospital arrival. Respiratory distress and miosis were observed in all patients (100%). Excessive salivation and bradycardia were present in 99.06%, muscle fasciculations in 98.12%, and vomiting in 96.24%. CNS depression was documented in 95.31% (Table III). Table IV showed the hospital course and outcomes. A total of 22.54% of patients required ventilatory support. The majority (77.46%) did not need mechanical ventilation. Hospital stay was ≤ 3 days in 93.43% of patients, but 6.57% required admission for 4–7 days. No patient stayed beyond seven days. The most common complication was respiratory failure (59.62%), followed by aspiration pneumonia (18.78%), seizures (12.68%), and other complications issues (8.92%). The most commonly reported reason for OP consumption was family conflict (28.64%), charted by financial stress (23.94%) and relationship problems (18.31%). Occupational exposure contributed to 14.08% of cases, academic pressure to 4.69%, and psychiatric illness to 4.23%. Accidental ingestion was reported in 3.29%, while 2.35% of cases cited other unspecified reasons. One patient (0.47%) had no clearly identified cause (Table V).

Table – I: Sociodemographic Characteristics of Patients with Organophosphorus Poisoning (n =213)

Characteristic	Frequency (n)	Percentage (%)
Age Group (years)		
≤ 20	9	4.23
21–30	67	31.46
31–40	78	36.62
> 40	59	27.70
Mean $\pm$ SD	34.32 $\pm$ 8.20	
Gender		
Male	86	40.38
Female	127	59.62
Marital Status		
Married	113	53.05
Unmarried	83	38.97
Divorced/Widowed	17	7.98
Occupation		
Student	15	7.04
Farmer	53	24.88
Housewife	102	47.89
Laborer	12	5.63
Unemployed	4	1.88
Others	27	12.68
Residence		
Urban	36	16.90
Rural	177	83.10

Table – II: Circumstances and Clinical Presentation of Poisoning

Variable	Frequency (n)	Percentage (%)
Type of Exposure		
Suicidal	178	83.57
Accidental	35	16.43
Homicidal	0	0.00
Route of Exposure		
Oral	178	83.57
Dermal	9	4.23
Inhalational	26	12.21
Prehospital Decontamination		
Yes	157	73.71
No	56	26.29

Table – III: Symptoms after taking organophosphorus compounds

Clinical Parameter	Frequency (n)	Percentage (%)
Symptoms at Presentation		
Vomiting	205	96.24
Excessive salivation	211	99.06
Respiratory distress	213	100.00
Bradycardia	211	99.06
Miosis	213	100.00
Muscle fasciculation	209	98.12
CNS depression	203	95.31

Table – IV: Clinical Outcome and Hospital Course

Outcome/Variable	Frequency (n)	Percentage (%)
Required Ventilatory Support		
Yes	48	22.54
No	165	77.46
Duration of Hospital Stay (days)		
≤ 3	199	93.43
4–7	14	6.57
>7	0	0.00
Complications Observed		
Respiratory failure	127	59.62
Aspiration pneumonia	40	18.78
Seizures	27	12.68
Others	19	8.92

Table – V: Reason behind consumption

Reason for Consumption	Frequency (n)	Percentage (%)
Family Conflict	61	28.64
Academic Pressure	10	4.69
Financial Stress	51	23.94
Relationship Problems	39	18.31
Psychiatric Illness (e.g., depression)	9	4.23
Accidental Ingestion	7	3.29
Occupational Exposure	30	14.08
Others	5	2.35
Not Reported	1	0.47

DISCUSSION

Organophosphorus compounds, widely used in agriculture and industry, vary in their chemical structure and clinical impact, influencing the pattern and severity of poisoning cases^[16]. This study provides a comprehensive overview of the sociodemographic, clinical, and outcome-related profiles of patients with organophosphorus (OP) poisoning in a tertiary care setting, adding valuable insight to the existing body of literature on pesticide self-poisoning. The predominance of poisoning among adults aged 31–40 years (36.62%) and females (59.62%) in our cohort aligns with regional patterns reported in earlier studies. For instance, a study in Bangladesh analyzing 282 medicolegal autopsies found that the highest incidence of OP poisoning occurred in the 21–30 years age group (38%), and females accounted for 52% of the cases^[17]. A notable finding in our study was that 83.10% of patients resided in rural areas, and nearly half (47.89%) were housewives. These demographics reflect the high availability of OP compounds in agrarian settings and their accessibility in domestic environments. A study comparing rural and urban settings found that rural areas had a higher incidence of pesticide poisoning, often due to the use of highly hazardous pesticides in agriculture^[18]. The occupational distribution in our study—especially the inclusion of farmers (24.88%) and housewives—emphasizes the intersection of socioeconomic vulnerability and occupational risk^[19]. The most common motive behind poisoning in our study was suicidal intent (83.57%), which is consistent with findings from a previous Bangladeshi study where self-poisoning remains a leading method of suicide^[20]. Our data show that family conflict (28.64%) and financial stress (23.94%) were primary drivers for ingestion. These stressors are frequently implicated in other studies as well, suggesting that psychosocial distress in under-resourced settings remains a key determinant of OP ingestion^[21]. Clinically, our cohort presented predominantly with the cholinergic toxidrome, including miosis and respiratory distress (both 100%), bradycardia and excessive salivation (99.06%), and muscle fasciculations (98.12%). These findings mirror those from large-scale studies on OP toxicity where muscarinic, nicotinic, and central nervous system symptoms are universally observed^[22]. CNS depression was noted in 95.31% of our patients, indicating the severity of poisoning and need for intensive supportive care^[23]. Despite prehospital decontamination in 73.71% of cases, 22.54% of patients required mechanical ventilation, and 59.62% experienced respiratory failure. These values are comparable to those reported by Giyanwani et al., where 24.6% required ventilation due to respiratory failure^[24]. Moreover, aspiration pneumonia and seizures were also seen in significant proportions, consistent with findings reported in previous studies, reinforcing the complexity of clinical management^[22]. Encouragingly, the majority of our patients (93.43%) had a hospital stay of 3 days or less, indicating prompt stabilization and effective early management. No patients required hospitalization beyond 7 days. This outcome contrasts with studies from rural hospitals in India and Nepal, where prolonged hospitalization was reported due to delayed presentation and limited ICU access^[25,26]. But our study shows

consistency with the findings of Al Jumaan et al.^[27]. Our study did not identify any homicidal poisonings, and only a small portion (16.43%) were accidental, consistent with the literature, which overwhelmingly identifies suicide as the predominant context for OP poisoning^[28].

Limitations of the study:

This study was limited by its single-center design and lack of biochemical confirmation due to the unavailability of cholinesterase assays, potentially affecting diagnostic precision. The cross-sectional nature restricted assessment of long-term outcomes or recurrence. Additionally, reliance on self-reported data introduced recall bias, particularly concerning exposure history and psychosocial factors. Seasonal trends and regional variability in OP poisoning patterns were not evaluated, limiting broader generalizability. Future multi-center studies with biochemical validation and longitudinal follow-up are recommended to address these gaps.

CONCLUSION AND RECOMMENDATIONS

This study delineates the considerable toxicological and epidemiological impact of organophosphorus (OP) poisoning in Bangladesh, particularly among young female individuals from agrarian communities. The predominant etiology was deliberate self-ingestion, primarily precipitated by psychosocial stressors including familial discord and economic adversity. Clinical manifestations frequently progressed to cholinergic crisis with respiratory compromise, necessitating intensive care and ventilatory support. The unavailability of biochemical assays impeded precise stratification of poisoning severity, thereby necessitating reliance on the Peradeniya Organophosphorus Poisoning (POP) Scale for clinical prognostication. These findings underscore the imperative for implementing structured mental health interventions, stringent agrochemical regulation, and context-specific preventive strategies to mitigate the morbidity and mortality associated with OP poisoning in resource-limited environments.

Funding: No funding sources

Conflict of interest: None declared

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

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