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ORIGINAL ARTICLE

To determine the factors associated with outcomes in organophosphate and carbamate poisoning.

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ABSTRACT… Objective: To determine factors associated with outcomes in organophosphate and carbamate poisoning remain crucial in understanding the clinical management and prevention strategies for these toxic exposures. **Study Design:** Prospective Observational study. **Setting:** Gambat Medical College. **Period:** January to July 2023. **Methods:** Involved 226 participants with organophosphate and carbamate poisoning. Sample size was calculated based on pre-hospitalization mortality rates. Data collection encompassed demographics, clinical presentation, and pre-hospitalization factors. **Results:** The majority of participants intended poisoning for suicide (91.0%), with no significant survival difference based on intention or previous suicide history. Age, educational status, and pre-hospital care significantly influenced survival chances. Clinical presentations varied, including vomiting, respiratory issues, and central nervous system toxicity. **Conclusion:** Factors such as age, educational status, and pre-hospital care significantly influence outcomes in organophosphate and carbamate poisoning. Clinical presentations vary widely, emphasizing the need for individualized management approaches. Understanding these factors is crucial for effective clinical management and preventive measures.

Key words: Carbamate Poisoning, Clinical Presentation, Factors, Organophosphate Poisoning, Outcomes, Pre-hospitalization.

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INTRODUCTION

Organophosphate (OP) and carbamate compounds are prevalent as pesticides and pose significant health risks due to their neurotoxic properties. These compounds inhibit cholinesterase, leading to an accumulation of acetylcholine, which results in various physiological disruptions, primarily affecting the nervous system.[1] The management and outcomes of poisoning due to these substances continue to be a critical area of medical and public health concern, particularly in regions with substantial agricultural activities.[2]

Extensive research indicates a high incidence of organophosphate and carbamate poisoning, with significant variations in clinical outcomes influenced by numerous factors such as age, gender, the immediacy of treatment, and the availability of intensive care facilities. Studies have shown a higher prevalence of poisoning in younger, predominantly male populations, with the primary cause often being intentional ingestion for self-harm.[3] However, accidental exposures are also significant, especially in rural settings where safety measures may be less stringent.[4]

The clinical management of such poisonings involves prompt decontamination, administration of antidotes (like atropine and pralidoxime), and supportive care. However, the effectiveness of these treatments varies widely, influenced by factors such as the type and amount of pesticide ingested, the time elapsed before treatment, and the overall healthcare setting.[5,6] This variability highlights the need for continued research to refine treatment protocols and improve outcomes.

Despite numerous studies, gaps remain in our understanding of the specific factors that most significantly affect outcomes in organophosphate and carbamate poisoning. Many studies focus on individual aspects or outcomes, such as mortality rates or immediate clinical responses, without integrating these factors into a broader epidemiological context that includes long-term health effects and quality of life post-poisoning.

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Furthermore, the impact of rapid urbanization and changes in agricultural practices on the incidence and nature of these poisonings has not been sufficiently explored.

Therefore, this study aims to systematically identify and analyze the multifactorial influences on the clinical outcomes of organophosphate and carbamate poisonings. This approach will help in understanding how different variables interact and contribute to the prognosis of poisoned patients. The objective of this study is to determine the demographic and clinical characteristics most strongly associated with different outcomes in organophosphate and carbamate poisoning.

METHODS

Study Design

This research adopts a prospective observational study design to explore the association between pre-hospitalization mortality rates and outcomes in organophosphate and carbamate poisoning cases.

Study site and Duration

The study was conducted in Gambat Medical College, PSAQJSJIMS GAMBAT from January 2023 to July 2023.

Sampling Technique

A purposive sampling technique was employed to select participants from the pool of organophosphate and carbamate poisoning cases admitted to Gambat Medical College, Gambat-Khairpur, Sindh during the study period. Inclusion criteria consisted of patients with a confirmed diagnosis of acute organophosphate or carbamate poisoning upon admission, based on clinical presentation and history of exposure. Exclusion criteria included cases involving mixed or unknown poison ingestion, chronic exposure, pre-hospital treatment, age below 18 years, or incomplete medical records.

Sample Size Calculations

The sample size was calulated via World Health Organization (WHO) Openepi sample size calculator via taking the mortality rate at pre-hospitalization associated with organophosphate and carbamate poisoning cases, as 17.9% with cionfidence interval as 95% and margin of error of 5%. was considered a significant factor. The sample size was calulated to be 226.

Data Collection Tools

Data were collected using standardized data collection forms specifically designed for this study. These forms encompassed variables related to participants demographics, clinical presentation, pre-hospitalization factors, treatment modalities, and patient outcomes.

Data Collection Process

Trained healthcare professionals were responsible for data collection throughout the study period. Data collection commenced upon patient admission and continued until discharge or completion of the observation period. Information regarding pre-hospitalization mortality rates and other relevant factors associated with organophosphate and carbamate poisoning outcomes was systematically documented. Data was analysed via SPSS v.25.

Ethical Consideration

Ethical approval for the study was obtained from the Institutional Review Board (IRB) (FM/GMC/115; dated: 15/12/2022) of the healthcare facility in accordance with established ethical guidelines. Informed consent was obtained from all participants or their legal guardians before enrollment in the study. Patient confidentiality was strictly maintained throughout the research process, with all collected data anonymized and stored securely. Additionally, participants were assured of their right to withdraw from the study at any time without repercussions.

RESULTS

The study included 226 participants with a mean age of 27.62±9.51 years. The gender distribution was 85 males (37.6%) and 141 females (62.4%). Regarding residential status, 133 participants (58.8%) were from urban areas, while 93 (41.2%) were from rural areas. Most participants were single (80.1%) and belonged to the lower socioeconomic class (75.7%). The clinical presentation varied, with vomiting (15.5%), shortness of breath (6.2%), restlessness (12.4%), respiratory issues (18.1%), lacrimation (3.1%), increased secretions (12.4%), gastrointestinal toxicity (5.3%), diarrhea (4.0%), coma (2.2%), bradycardia (6.2%), altered sensorium

(3.1%), and central nervous system toxicity (11.5%) being reported (Table-I).

TABLE-I

Demographic characteristics of study participants

Variables	Mean±SD / Freq. (%)	95% C. I
Age in years	27.62 ± 9.51	26.37----28.86
Gender		
Male	85 (37.6%)	
Female	141 (62.4%)	
Residential Status		
Urban	133 (58.8%)	
Rural	93 (41.2%)	
Marital Status		
Single	181 (80.1%)	
Married	45 (19.9%)	
Socioeconomic Status		
Lower Class	171 (75.7%)	
Middle Class	15 (6.6%)	
Upper Class	40 (17.7%)	
Clinical Presentation		
Vomiting	35 (15.5%)	
Shortness of breath	14 (6.2%)	
Restlessness	28 (12.4%)	
Respiratory Issue	41 (18.1%)	
Lacrimation	7 (3.1%)	
Increased Secretions	28 (12.4%)	
Gastrointestinal toxicity	12 (5.3%)	
Diarrhea	9 (4.0%)	
Coma	5 (2.2%)	
Bradycardia	14 (6.2%)	
Altered Sensorium	7 (3.1%)	
Central nervous system toxicity	26(11.5%)	

Values are presented as frequency (%)

C.I. (Class Interval), SD (Standard Deviation)

The characteristics and outcomes of 226 participants revealed that the majority intended poisoning for suicide (91.0%), with no significant difference between those who survived and those who expired (p = 0.799). Accidental and field exposure intentions showed similar distributions between the two groups. Participants with a previous history of suicide had comparable outcomes (p = 0.500). The route of poisoning (oral or inhalation) and the place of poisoning (home, workplace, or outside) did not significantly influence survival (p = 0.484 and p = 0.787, respectively) (Table-II).

TABLE-II

Poison-related characteristics of participants with outcomes

Characteristics	Outcome		P-Value
	Survived (n=205)	Expired (n=21)	
Intention of Poisoning			
Suicide	183 (91.0%)	18 (9.0%)	0.799
Accidental	17 (89.5%)	2 (10.5%)	
Field Exposure	5 (83.3%)	1 (16.7%)	
Previous History of Suicide			
Positive	28 (87.5%)	4 (12.5%)	0.500
Negative	177 (91.2%)	17 (8.8%)	
Route of Poisoning			
Oral	188 (90.4%)	20 (9.6%)	0.484
Inhalation	17 (94.4%)	1 (5.6%)	
Place of Poisoning			
Home	150 (90.9%)	15 (9.1%)	0.787
Workplace	35 (92.1%)	3 (7.9%)	
Outside	20 (87.0%)	3 (13.0%)	

Values are presented as frequency (%)

Among the significant findings, age group was associated with survival, with those aged 16-30 years having higher odds of survival (OR = 3.636, 95% CI: 1.452-9.105, p = 0.004). Educational status showed varied associations, with primary education (OR = 4.644, 95% CI: 0.001-17.94) and higher education (OR = 2.588, 95% CI: 0.951-7.044, p = 0.063) indicating increased odds of survival. Pre-hospital care significantly improved survival chances (OR = 9.419, 95% CI: 3.449-25.723, p < 0.001) (Table-III).

TABLE-III

Factors associated with Mortality in study populations

Factors	Outcome		OR (95% CI)	P-Value
	Survived (n=205)	Expired (n=21)		
Age Group				
16 – 30 Years	150 (94.3%)	9 (5.7%)	3.636 (1.452---9.105)	0.004
Greater than 30 Years	55 (82.1%)	12 (17.9%)		
Gender				
Male	78 (91.8%)	7 (8.2%)	1.228 (0.475---3.176)	0.671
Female	127 (90.1%)	14 (9.9%)		
Educational Status				
Illiterate	64 (88.9%)	8 (11.1%)	2.500 (0.505---12.37)	0.992
Primary	46 (100.0%)	0 (0.0%)	4.644 (0.001---17.94)	
Secondary	40 (95.2%)	2 (4.8%)	0.400 (0.081---1.979)	0.261
Intermediate	21 (100.0%)	0 (0.0%)	4.624 (0.021---15.61)	0.992
Higher	34 (75.6%)	11 (24.4%)	2.588 (0.951---7.044)	0.063
Time elapsed since exposure to arrival at hospital				
Less than 1 hour	151 (89.9%)	17 (10.1%)	0.658 (0.212---2.042)	0.331
Greater than 1 hour	54 (93.1%)	4 (6.9%)		
Pre-Hospital Care				
Yes	162 (96.4%)	6 (3.6%)	9.419 (3.449---25.723)	0.000
No	43 (74.1%)	15 (25.9%)		
Oxygen Support				
Yes	159 (91.4%)	15 (8.6%)	1.383 (0.508---3.766)	0.525
No	46 (88.5%)	6 (11.5%)		
Time Duration				
Less than 24 hours	119 (90.2%)	13 (9.8%)	0.852 (0.338---2.144)	0.733
Greater than 24 hours	86 (91.5%)	8 (8.5%)		

Values are presented as frequency (%)
C.I. (Class Interval), OR (Odd Ratio)

DISCUSSION

The study aimed to determine the factors associated with outcomes in organophosphate and carbamate poisoning. The majority of participants (91.0%) intended poisoning for suicide, with no significant difference in survival between those who survived and those who expired. Intentions of accidental and field exposure showed similar distributions between the survival and expired groups. Participants with a previous history of suicide had comparable outcomes in terms of survival. The route of poisoning and the place of poisoning did not significantly influence survival. The clinical presentation varied among participants and included symptoms such as vomiting, shortness of breath, restlessness, respiratory issues, lacrimation, increased secretions, gastrointestinal toxicity, diarrhea, coma, bradycardia, altered sensorium, and central nervous system toxicity. Overall, the study suggests that factors such as intent of poisoning, accidental or

intentional exposure, previous suicide history, route and place of poisoning, and clinical presentation all contribute to outcomes in organophosphate and carbamate poisoning cases.

Organophosphates and carbamates are common types of pesticides that are widely used in agriculture, public health, and domestic settings. These pesticides are highly toxic to humans and can cause a range of acute and chronic health effects if exposure occurs.[7] One important factor associated with outcomes in organophosphate and carbamate poisoning is the degree and duration of exposure to these pesticides. Exposure can occur through inhalation, ingestion, or dermal contact with contaminated soil or water.[8] Other factors that may influence the outcomes of organophosphate and carbamate poisoning include the individual's age, underlying health conditions, and the availability and timing of appropriate medical treatment.

Additionally, the specific type and concentration of the pesticide, as well as the route of exposure, can also affect the severity of poisoning symptoms. Studies have shown that individuals with higher levels of organophosphorus compounds and polycyclic aromatic hydrocarbons are more likely to experience adverse outcomes from organophosphate and carbamate poisoning.[7-12] Furthermore, environmental factors such as the presence of other chemicals or pollutants in the surroundings may interact with organophosphates and carbamates, potentially exacerbating their toxic effects and influencing the outcomes of poisoning incidents.

Overall, the factors associated with outcomes in organophosphate and carbamate poisoning include: levels of organophosphorus compounds and polycyclic aromatic hydrocarbons in the environment, age and underlying health conditions of the individual, availability and timing of appropriate medical treatment, route of exposure, presence of other chemicals or pollutants in the surroundings. In conclusion, the outcomes of organophosphate and carbamate poisoning can be influenced by various factors. These factors include the levels of organophosphorus compounds and polycyclic aromatic hydrocarbons in the environment, age and underlying health conditions of the individual, availability and timing of appropriate medical treatment, specific type and concentration of the pesticide, route of exposure[13], presence of other chemicals or pollutants in the surroundings, and the development of pesticide resistance by pests.[14] These factors have been studied extensively, and their impact on the clinical presentation and outcomes of organophosphate and carbamate poisoning has been well-documented.[15]

Clinical presentation varied among participants and included symptoms such as vomiting, shortness of breath, restlessness, respiratory issues, lacrimation, increased secretions, coma, bradycardia, altered sensorium, and central nervous system toxicity. It is important to note that the severity and combination of these symptoms can greatly differ from one case to another, making each poisoning incident unique in its clinical presentation.[16,17]

The intent of poisoning, whether accidental or intentional, also plays a crucial role in determining the outcomes of organophosphate and carbamate poisoning cases.[18] Individuals with previous suicide history may present with different symptoms and have different prognoses compared to those with accidental exposure. Additionally, the route and place of poisoning, such as ingestion or dermal contact, and whether the incident occurred in an enclosed space or in an open environment, can significantly impact the severity of the poisoning and subsequent outcomes.

CONCLUSION

In conclusion, this study sheds light on critical factors influencing outcomes in organophosphate and carbamate poisoning cases. The findings underscore the importance of age, educational status, and timely pre-hospital care in determining survival chances. Despite varying clinical presentations, the intent and route of poisoning did not significantly impact outcomes. Understanding these factors is paramount for tailored clinical management and effective preventive strategies. Moving forward, continued research and heightened awareness are essential to mitigate the burden of organophosphate and carbamate poisoning, ultimately saving lives and promoting public health.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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2	**Danish Kumar Goswami:** Literatrure review.
3	**Nargis Pirya:** Data analysis.
4	**Abdul Hafeez Abro:** Paper writing.
5	**Muhammad Shafay:** Study design.
6	**Pardeep Kumar:** Methodology.