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RESEARCH ARTICLE
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INVESTIGATING POISONING INCIDENTS: PATTERNS, CONTRIBUTING FACTORS, AND CLINICAL OUTCOMES REPORTED IN THE EMERGENCY DEPARTMENT OF A TERTIARY CARE HOSPITAL, KARACHI, PAKISTAN

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ABSTRACT

Objective: This study aimed to determine the frequency, patterns, factors, and clinical outcomes associated with poisoning cases reported in a tertiary care hospital's emergency department (ED) in Karachi, Pakistan.

Study Design: Cross-sectional study

Place and duration of study: Emergency Medicine Department, Dow University Hospital, Karachi, Pakistan from March to August 2024.

Methodology: A total of 220 poisoning cases were included aged 18-70 years of both genders and who visited the ED of the study setting. Data was gathered through a pre-designed questionnaire. Patients were followed during ED stay, inpatient services, and till discharge.

Results: Over half of the cases took 1 to 5 hours to reach the hospital (n=166, 75.5%), 80.5% (n=177) had an oral route of poison administration, and most of them were poisoned with household chemicals (n=40, 18.2%), with low SES being major reason (n=19, 8.6%). Most had left against medical advice (LAMA) as their clinical outcome (n=102, 46.4%). Regarding association, it was found that most patients who reached the hospital after one hour (p-value=0.033), those who were drug overdosed (p-value=0.002), who ingested opioids (p-value=0.000) were strongly associated with the clinical outcome.

Conclusion: The findings indicate that younger males from lower socioeconomic backgrounds were at higher risk, with household chemicals and pharmaceuticals being the most common poisoning agents. The study also highlighted critical issues such as delayed hospital arrival and a high rate of

patients leaving against medical advice (LAMA), which negatively impact clinical outcomes.

Keywords: Frequency, pattern, associated factors, poisoning cases, Pakistan.

INTRODUCTION

Poisoning cases are reported in individuals of all ages and income levels.[1] Further, according to WHO, more than three million poisoning cases with 251,881 fatalities occur globally each year, with poor nations accounting for 99% of fatal poisonings,[2] primarily among agricultural workers and mostly among the married younger aged males, due to several reasons including socioeconomic factors and agricultural practices.[3]

For instance, a study conducted in Southern India at a tertiary care hospital in 2021 reported that the majority of poisoning cases were due to suicidal attempts and suicide in which mostly females (60%) were involved and it was observed that organophosphorus is the most widely used poison for suicide.[3] Nevertheless, in Pakistan, low socioeconomic status is associated with various challenges, including accidental and suicidal poisoning. Several studies have highlighted the association between low socioeconomic status and poisoning in Pakistan. For instance, a study conducted at District Head Quarter Hospital in Sahiwal, Pakistan in 2018 found that lower-income families are more predisposed to accidental poisoning due to factors such as unsafe storage of medicines and chemicals.[4] Further, studies have determined that accidental poisoning cases are mostly seen in younger populations not only in Pakistan but all over the world[5] and the most common agent being used in accidental poisoning in Pakistan is kerosene oil.[6] Another common poison used in Pakistan, and that too for suicidal reasons is aluminum phosphide, interestingly, its use is also more common in females than males.[7] Hence, a thorough understanding of the type and volume of poisoning incidents in a certain region is required for early diagnosis and timely treatment and for introducing new and assessing existing preventive measures. The geographical distribution of the pattern of poisoning varies and is determined by the availability of poisons, religious and cultural influences, the predominant occupation in the region, and other factors.[8]

Thus, this study aimed to determine the frequency & patterns in addition to the factors associated with poisoning cases reported in the Emergency department of a tertiary care hospital in Karachi, Pakistan. In addition to determining the clinical outcomes associated with these poisoning cases. The results of this study would help to develop a thorough understanding of the type and volume of poisoning incidents in the Pakistani community which is required not only for early diagnosis and timely treatment but also for introducing new methods and assessing existing prevention measures.[9, 10]

METHODOLOGY

This was a descriptive cross-sectional study conducted at the Emergency Medicine Department, Dow University Hospital, Karachi, Pakistan through a non-probability convenience sampling technique. The data was collected from March to August 2024, after obtaining the approval from Institutional Review Board of the Dow University Hospital via the approval number IRB-3337/DUHS/Approval/2024/35, dated: 12-02-2024.

The sample size was calculated using open Epi online software version 2.0. A study from Maharashtra[1] reported a percentage frequency of 67.7% of organophosphate poisoning, using a 95% confidence interval and a 5% margin of error with at least a 75% response distribution rate, the sample size was calculated to be 208. Adding a 10% non-response ratio, the total sample size was calculated to be 220.

The inclusion criteria of the study included poisoning cases aged 18-70 years of either gender who visited the emergency department (ED) of the study setting. While, the non-poisoning cases, pediatric cases below the age of 12 years, non-hospitalized cases, non-acute poisoning cases (chronic poisoning cases), cases with incomplete or missing medical information,

intentional self-harm cases not involving poisoning, and cases transferred from other health care

facility with incomplete information were all excluded.

Data of all patients meeting the inclusion criteria was gathered through a pre-designed questionnaire. Patient data was collected including MR numbers, patient demographics, diagnosis on admission, lab investigations (order by duty doctor), type of poisoning and drug overdose, timing of poisoning, any complication related to poisoning, and disposition. Patients were followed during ED stay, in patient services, and till discharge.

Statistical software for social sciences (SPSS version 23) was used to analyze the data. Independent study variables included age, gender, and demographics, while the dependent variables included diagnosis on admission, lab investigations, type of poisoning and drug overdose, timing of poisoning, any complication related to poisoning, and disposition. All categorical variables were presented as frequency and percentages and compared using the chi-squared test. Statistical analyses were done with an independent t-test. A p-value of < 0.05 will be the cut-off for significance.

RESULTS

A total of 220 poisoned cases were included in the study with a mean age of 29.35±12.187. A majority of cases were males (n=121, 55%), had education till primary level (n=111, 50.5%), and had middle socioeconomic status (SES) (n=105, 47.7%). Over half of the cases took 1 to 5 hours to reach the hospital (n=166, 75.5%). Further, 80.5% (n=177) had an oral route of poison administration with no associated complications (n=185, 84.1%), where most of them were poisoned with household chemicals ingestion (n=40, 18.2%). Additionally, most cases reported low SES as their reason for poisoning (n=19, 8.6%). Most had left against medical advice (LAMA) as their clinical outcome (n=102, 46.4%) (Table 1).

Table 1: Demographic, clinical outcomes, patterns, and factors associated with poisoning cases

Variables		quency (n)	centage (%)
Gender	Male	121	55.0
	Female	99	45.0
Educational Level	Primary School	111	50.5
	High School	43	19.5
	College/University	65	29.5
	Postgraduate	1	0.5
Occupation	Employee	27	12.3
	Doctor	1	0.5
	Driver	1	0.5
	Electrician	1	0.5
	House Keeper	8	3.6
	Framer	18	8.2
	House Wife	67	30.5
	Retired	4	1.8
	Shopkeeper	19	8.6
	Student	53	24.1
	Unemployed	21	9.5
Socioeconomic Status	Low 10k-50K	95	43.2
	Middle 50k-150k	105	47.7
	High 150K -350k	20	9.1
Time to reach Hospital	Less than 1 Hour	12	5.5
	1-5 Hours	166	75.5
	6-10 Hours	21	9.5
	More than 10 Hours	21	9.5

Route of Poison Administration	Oral	177	80.5
	IIV	35	15.9
	Inhalational	8	3.6
Any associated Complication	None	185	84.1
	Coma	1	0.5
	Laryngeal Edema	9	4.1
	Arrhythmias	2	0.9
	Bleeding	2	0.9
	Others	21	9.5
Poison Name	Organophosphate	27	12.3
	Benzodiazepine	14	6.4
	Opioids	28	12.7
	Household Chemicals	40	18.2
	Paracetamol	9	4.1
	Rodenticide	14	6.4
	Anti-Depressants	21	9.5
	Others	58	26.4
Reason of poisoning	Lack of Awareness	10	4.5
	Unsafe Storage	4	1.8
	Unsafe Handling of Pesticides and Chemicals in Agriculture.	6	2.7
	Low Socioeconomic Status	19	8.6
	Substandard Housing: Exposure to Environmental Toxins Due to Inadequate Housing Condition	18	8.2
	Addiction in Family	7	3.2
	Physical or Psychological Disorders	16	7.3
	Antipsychotic Treatment	18	8.2
	Others	122	55.5
Clinical Outcome	Medical Intensive Care Unit (MICU)	86	39.1
	High Dependency Units (HDUs)	5	2.3
	WARD	13	5.9
	Leave Against Medical Advice (LAMA)	102	46.4
	Discharge	14	6.4

It was found that the majority of cases had nausea and vomiting as the prevalent symptom of poisoning (n=95, 43.2%), followed by abdominal pain and cramping (n=78, 35.5%), and confusion and altered mental state (n=47, 21.4%) (Figure 1).

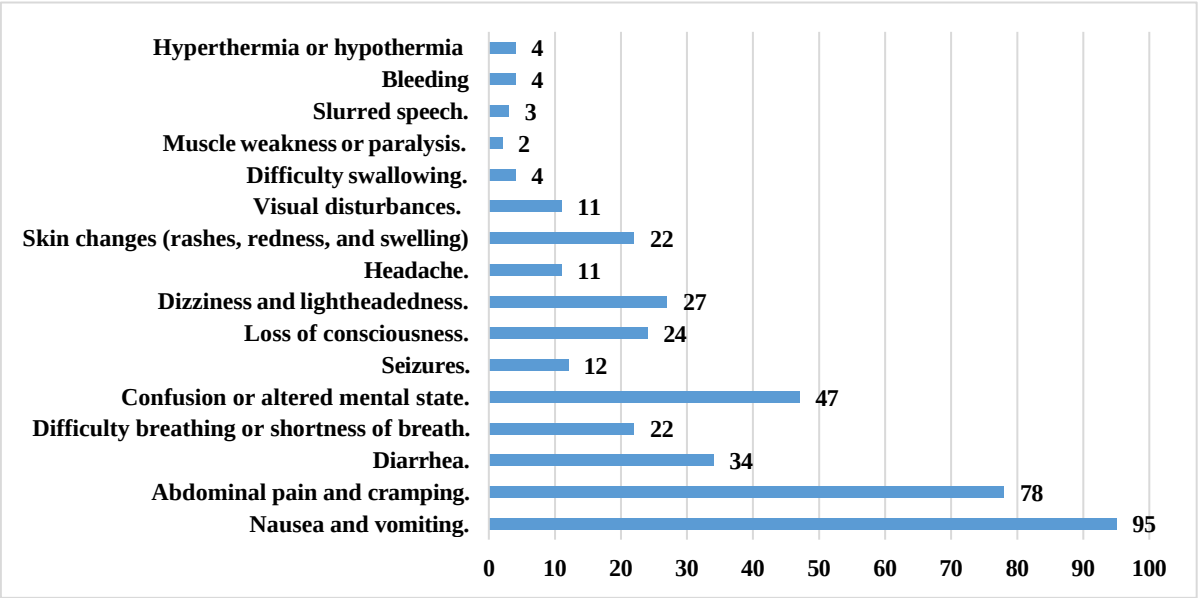

Figure-1: Associated symptoms found among the included poisoning cases (n=220; multiple answers marked)

According to the diagnosis at admission, the majority of the cases were drug overdose (n=69, 31.4%) followed by household chemical ingestion (n=68, 30.9%) (Figure 2).

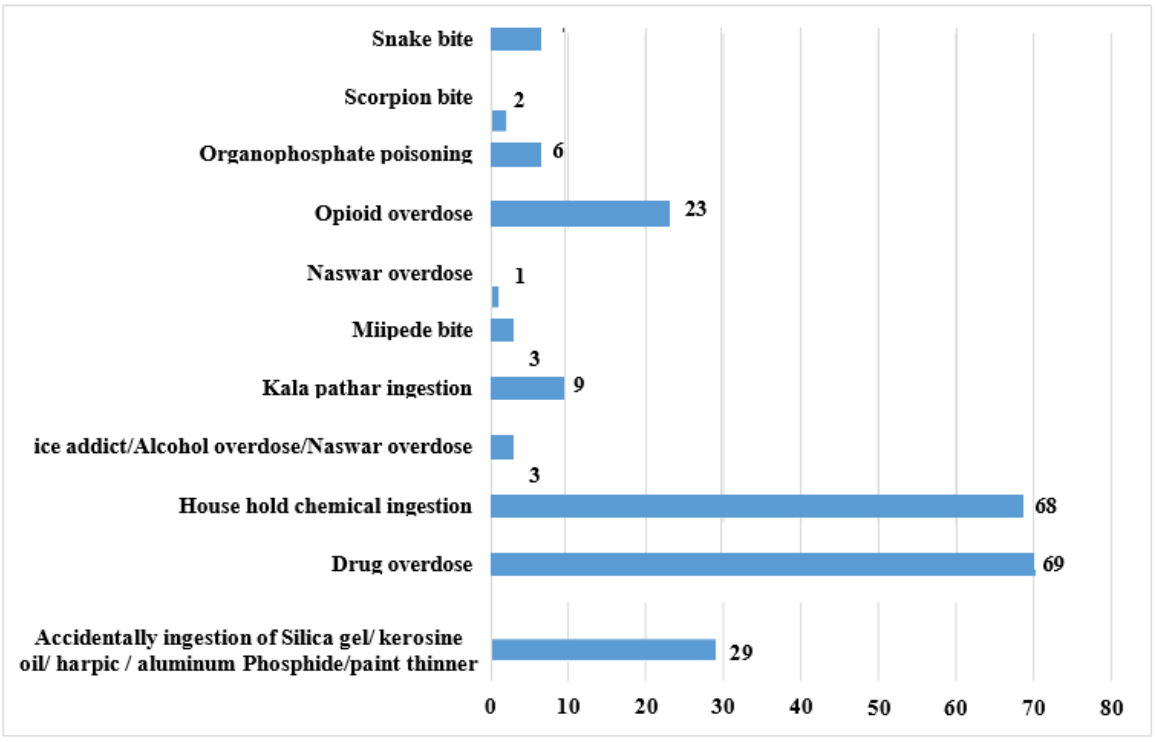

Figure-2: Diagnosis is done at the time of admission among the included poisoning cases (n=220)

Regarding association, it was found that most patients who reached the hospital after one hour were admitted to MICU and took LAMA (p-value=0.033). Further, it was found that those who were drug overdosed were admitted to MICU, and most of the participants who were admitted due to household chemical ingestion took LAMA (p-value=0.002). Additionally, ingestion of opioids,

followed by household chemicals, and organophosphate was also strongly associated with admission to MICU, followed by LAMA (p-value=0.000). Moreover, the reason for poisoning was also strongly associated with the clinical outcome, where LAMA was the most common (p-value=0.001) (Table 2).

Table 2: Association of patterns and factors of the poisoning cases with their clinical outcomes

Variables		MICU	HDU	Ward	LAMA	Discharge	P-value
Time to reach Hospital	Less than 1 Hour	3	1	0	7	1	0.033
	1-5 Hours	69	1	9	80	7	
	6-10 Hours	6	1	1	10	3	
	More than 10 Hours	8	2	3	5	3	
Diagnosis at the time of admission	Accidentally ingestion of Silica gel/kerosine oil/harpic/alu minum Phosphide/pai nt thinner	18	0	0	4	7	0.002
	Drug overdose	34	1	11	22	1	
	Household chemical ingestion	13	4	0	47	4	
	ice addict/Alcohol overdose/Nas war overdose	1	0	0	1	1	
	Kala Pathar ingestion	8	0	0	1	0	
	Millipede bite	0	0	0	2	1	
	Naswar overdose	0	0	0	1	0	
	Opioid overdose	9	0	1	13	0	
	Organophosph ate poisoning	3	0	0	3	0	
	Scorpion bite	0	0	0	2	0	
	Snakebite	0	0	1	6	0	
Route of Poison Administration	Oral	67	5	12	81	12	0.815
	IIV	15	0	1	18	1	
	Inhalational	4	0	0	3	1	
Poison Name	Organophosp hate	10	0	1	15	1	0.000
	Benzodiazepi ne	0	2	7	5	0	
	Opioids	17	0	0	10	1	
	Household Chemicals	11	0	0	24	5	
	Paracetamol	5	0	0	4	0	
	Blackstone: Paraphenylen e Diamine	8	0	0	1	0	
	(PPD) (Kala Pathar)						
	Rodenticide	2	0	0	11	1	
	Anti- Depressants	9	2	4	5	1	
	Others	24	1	1	27	5	
	Lack of Awareness	2	0	0	5	3	
	Unsafe Storage	2	0	0	2	0	

Reason of poisoning	Unsafe Handling of Pesticides and Chemicals in Agriculture.	3	0	0	3	0	0.001
	Low Socioeconom ic Status	2	0	0	16	1	
	Substandard Housing	5	0	1	11	1	
	Addiction in Family	1	0	0	6	0	
	Physical or Psychological Disorders	5	1	0	8	2	
	Antipsychotic Treatment	8	2	5	3	0	
	Others	58	2	7	48	7	

Medical Intensive Care Unit (MICU), High Dependency Units (HDUs), Leave against Medical Advice (LAMA)

DISCUSSION

The study presents a comprehensive analysis of 220 poisoning cases, highlighting key demographic characteristics, patterns, and outcomes. The findings underscore several important aspects of poisoning in the studied population, particularly concerning the demographics, types of poisoning, and clinical outcomes.

The majority of the poisoning cases involved males (55%) with a mean age of 29.35 years. Most of the individuals had only primary education (50.5%) and belonged to a middle socioeconomic status (47.7%). This demographic pattern suggests that younger, less educated males from lower socioeconomic backgrounds were more susceptible to poisoning, possibly due to increased exposure to hazardous environments or a lack of awareness about safe handling practices. Similar to this study, other studies have reported a higher incidence of poisoning among males and younger individuals. For instance, a study conducted covering the whole of Southeast Asia found that the majority of poisoning cases were males, with a mean age comparable to this study. The prevalence of poisoning among young adults is often attributed to occupational hazards and risky behaviors associated with this demographic group.[11] International studies, particularly from high-income countries like the United States and the United Kingdom, also report a higher incidence of poisoning among younger individuals. However, there is often a more balanced gender distribution compared to the male predominance seen in Pakistani studies.[12, 13] This difference might be attributed to varying social roles and exposure risks in different cultural contexts.

Oral ingestion was the predominant route of poisoning (80.5%), with household chemicals being the most commonly ingested substances (18.2%). The frequent use of household chemicals indicates a significant risk factor within domestic settings, where these substances might not be adequately secured, leading to accidental or intentional ingestion. Local studies have also identified household chemicals, pesticides, and pharmaceuticals as the most common agents involved in poisoning. For example, research conducted in Karachi highlighted organophosphates (commonly found in pesticides) as a leading cause of poisoning,[14] consistent with the findings of this study where organophosphates and household chemicals were significant contributors to poisoning cases.

The association between time to hospital arrival and the likelihood of being admitted to the Medical Intensive Care Unit (MICU) or taking LAMA ($p = 0.033$) further supports the importance of timely medical access. The delayed hospital arrival times reported in this study are also consistent with findings from rural areas of Pakistan, where healthcare infrastructure is often less accessible.[15, 16] The high rate of patients leaving against medical advice (LAMA) in this study mirrors findings from other Pakistani studies, where financial constraints, dissatisfaction with care, and cultural factors contribute to LAMA decisions.[17]

The delayed hospital arrival times reported in this study contrast with findings from high- income countries, where emergency medical services are more efficient, leading to quicker hospital admissions. The rate of LAMA is also generally lower in developed countries, where insurance coverage and social support systems mitigate the financial and social pressures that contribute to patients leaving care prematurely. However, in countries like India and Nigeria, LAMA rates can be high, mirroring the trends observed in Pakistan.[18, 19]

The study found significant associations between the type of poisoning and clinical outcomes. For example, ingestion of opioids, household chemicals, and organophosphates was strongly associated with MICU admission and a higher likelihood of LAMA ($p = 0.000$). These substances are known for their severe toxic effects, necessitating intensive care and leading to complex medical decisions, including the decision to leave the hospital prematurely.[20] Globally, pharmaceuticals, especially antidepressants and analgesics, are frequently reported as leading causes of poisoning, especially in high-income countries.[21] This is somewhat different from the findings in this study, where household chemicals and organophosphates were more prominent. In many developed countries, stricter regulations on chemical storage and handling might reduce the incidence of household chemical poisoning, shifting the focus to prescription and over-the-counter medications as primary agents of poisoning.[21] Additionally, the reasons for poisoning, such as low socioeconomic status and substandard housing, were significantly associated with the clinical outcome, particularly with LAMA ($p = 0.001$). This highlights the broader social determinants of health, where socioeconomic disadvantages contribute to both the occurrence of poisoning and the subsequent clinical trajectory. The association between lower socioeconomic status and poisoning has been a recurring theme in Pakistani research. Studies in various regions, including Khyber

Pakhtunkhwa and Sindh, have reported that individuals from lower socioeconomic backgrounds are more vulnerable to poisoning, primarily due to inadequate education, unsafe storage practices, and limited access to healthcare facilities.[22, 23] Timing was another crucial factor, as most cases took 1 to 5 hours to reach the hospital (75.5%). The delayed arrival is concerning as it might contribute to worse clinical outcomes, particularly in severe poisoning cases requiring immediate medical intervention.

International studies also recognize the role of socioeconomic status in poisoning cases. However, the impact is often more pronounced in low- and middle-income countries, including Pakistan. In countries with better healthcare access, the association between socioeconomic status and poisoning outcomes might be less stark, although still significant. For example, studies from Brazil and India have also highlighted the increased risk of poisoning among economically disadvantaged groups, similar to the findings of this study.[18, 24]

Internationally, there has been a stronger emphasis on public health interventions to reduce poisoning incidents, such as poison control centers, public awareness campaigns, and regulatory measures.[25] The differences in public health infrastructure between Pakistan and high-income countries might account for some of the variations in poisoning patterns and outcomes observed in this study.[21]

This study provides valuable insights into the epidemiology of poisoning in a specific population, emphasizing the need for improved public health strategies to address the underlying social and economic factors contributing to poisoning.

LIMITATIONS OF THE STUDY

The study was based on a relatively small sample size of 220 cases from a specific geographic area, which might limit the generalizability of the findings to broader populations. As a retrospective study, the research relies on existing medical records, which might have limitations in data accuracy and completeness. Missing data, inconsistencies in record-keeping, or recall bias could affect the reliability of the findings. The study might be subject to selection bias, as it includes only patients who presented to a specific hospital. Cases managed in other healthcare settings or not

seeking medical care might have different characteristics, leading to an incomplete picture of poisoning trends in the community.

CONCLUSION

The findings indicate that younger males from lower socioeconomic backgrounds were at higher risk, with household chemicals and pharmaceuticals being the most common poisoning agents. The study also highlighted critical issues such as delayed hospital arrival and a high rate of patients leaving against medical advice (LAMA), which negatively impact clinical outcomes. The results emphasize the need for targeted public health interventions, including educational campaigns to raise awareness about the safe handling and storage of potentially toxic substances, particularly in low-income communities. Improving access to timely medical care and addressing the socioeconomic factors contributing to poisoning are essential for reducing the incidence and improving outcomes of poisoning cases.

Conflict of Interest: None.

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