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Impact of Early Intervention on Recovery Outcomes in Organophosphorus Poisoning: A Tertiary Hospital Analysis

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Abstract
OP poisoning is a common problem, especially in areas where pesticides are heavily used, such as agricultural regions. It presents significant health dangers, particularly in developing nations, with potential consequences such as respiratory failure and even death. The objective of this study is to examine the demographic characteristics, clinical presentations, treatments outcomes of patients with OP poisoning. The goal is to identify factors that impact prognosis and contribute to the development of enhanced treatment strategies. An analysis was conducted at a tertiary care hospital, examining medical records of patients diagnosed with OP poisoning. Collected data encompassed various aspects such as demographic information (age, sex), clinical signs (pupil size, aspiration, crepitations), time before hospital presentation, treatments given, duration of hospital stay, patient outcomes (discharge, death)first aid provided. Patients above 14 years old who had OP poisoning were included in the study. Patients under 14, those with other types of poisoning those who were deceased upon arrival were excluded. The research involved a total of 78 participants, with an average age of 28.92 years and a nearly equal representation of both genders. Most of the patients arrived at the hospital within six hours of being poisoned. The patient exhibited miosis and experienced difficulty breathing. Around 89.74% of the individuals received targeted antidotal treatment (atropine and pralidoxime). The rate of discharge was 83.33%, while the mortality rate stood at 16.67%. The impact of first aid on the overall outcomes was minimal. Young adults involved in farming must receive immediate and efficient medical treatment to address the effects of OP poisoning. While many patients did receive prompt treatment, the mortality rate is still significant, underscoring the importance of improving preventive and therapeutic strategies. Prompt hospital arrival is linked to better recovery results, highlighting the significance of quick action and awareness regarding the dangers of OP exposure.

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Key Words
Organophosphorus poisoning, clinical outcomes, treatment, demographic characteristics, early intervention, mortality rate, agricultural pesticides

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INTRODUCTION

Organophosphorus (OP) poisoning is a critical global health issue, particularly prevalent in developing regions where these compounds are extensively utilized as agricultural pesticides[1,2]. OP compounds inhibit the enzyme acetylcholinesterase, leading to an accumulation of the neurotransmitter acetylcholine in the synaptic cleft[1]. This results in prolonged stimulation of cholinergic receptors, which can manifest a range of symptoms from mild, such as nausea and headaches, to severe, including respiratory failure, convulsionsdeath[1,2].

The demographic profile of patients affected by OP poisoning tends to skew younger, reflecting the active involvement of this age group in agricultural activities, where exposure risk is high[2]. Studies have shown a relatively balanced gender distribution among those affected, indicating that both males and females are equally susceptible to OP poisoning[1].

Clinically, OP poisoning presents with a diversity of symptoms that significantly impact patient outcomes. Common clinical signs include miosis, Tachycardia, respiratory distress, and gastrointestinal symptoms[1,2,3]. The variability in clinical presentations necessitates a thorough and prompt clinical assessment to ensure accurate diagnosis and timely treatment[1]. Early intervention is crucial, as the prognosis of OP poisoning significantly improves with prompt medical care[1]. Patients presenting within six hours of exposure generally have better outcomes compared to those presenting later[1].

Treatment of OP poisoning typically involves the use of atropine, an antimus carinic agentpralidoxime, which reactivates acetylcholinesterase[1,3]. The high rate of treatment administration in affected patients underscores the critical need for immediate medical intervention to manage symptoms and prevent complications[1].

Despite advances in medical care, OP poisoning remains associated with significant morbidity and mortality. Studies indicate that while a majority of patients are successfully treated and discharged, a substantial proportion succumb to the poisoning, highlighting the need for improved preventive measures and more effective treatment protocols[1,2].

Emerging research has explored the potential of novel therapeutic interventions, such as bioscavengers and oxime-based treatments, to improve the efficacy and accessibility of antidotes[3,4]. Additionally, efforts to strengthen public health infrastructure, enhance community-based educationpromote the safe handling and storage of OP pesticides are crucial to mitigate the impact of this global health crisis[2,3].

The primary objective of this research is to analyze the demographic characteristics, clinical presentations outcomes of OP poisoning to identify key factors that influence the prognosis. By understanding these elements, this study aims to contribute to the development of targeted interventions and enhanced treatment protocols that could reduce mortality and improve recovery rates in patients affected by OP poisoning.

MATERIALS AND METHODS

Study Design and Population: This retrospective study aimed to analyze the demographic characteristics, clinical presentations, treatmentsoutcomes of patients with Organophosphorus (OP) poisoning. Conducted at a tertiary care hospital, the study involved the collection and analysis of data from medical records of patients admitted with a confirmed diagnosis of OP poisoning over a specified period. The inclusion criteria encompassed all OP poisoning cases presented to the emergency department with patients aged above 14 years. Exclusion criteria included patients aged less than 14 years, cases of poisoning other than OPpatients who were brought in dead. The primary focus was on extracting key variables such as demographic information (age and sex of the patients), clinical signs (presence of miosis, aspirationcrepitations), time before presentation (categorized as less than 6 hours or more than 6 hours), treatments administered (whether treatment was given or not), duration of hospital stay (number of days spent in the hospital), patient outcomes (whether the patient was discharged or died)whether first aid was administered before hospital presentation.

Data Collection: Data extraction focused on collecting demographic information including the age and sex of the patients. Clinical signs were noted, particularly the presence of miosis or mydriasis, aspirationcrepitations. The time elapsed before the patient presented to the hospital was categorized as either less than 6 hours or more than 6 hours. The treatments administered were documented, indicating whether treatment was given or not. The duration of hospital stay was recorded in terms of the number of days spent in the hospital. Patient outcomes were categorized based on whether the patient was discharged or died. Additionally, information on whether first aid was administered before hospital presentation was collected. This comprehensive data collection approach aimed to provide a detailed overview of the patient population and the factors influencing outcomes.

Statistical Analysis: Data analysis involved both descriptive and inferential statistics to thoroughly understand the study population and identify factors influencing patient outcomes. Descriptive statistics included summary statistics for age (mean, standard deviation, medianinterquartile range) and frequencies for sex, which were calculated and presented in a frequency distribution table to provide a demographic

overview of the study population. This combination of statistical methods enabled a comprehensive analysis of the demographic characteristics, clinical presentations, treatmentsoutcomes in patients with OP poisoning, offering valuable insights into the factors that influence patient prognosis and recovery.

RESULTS AND DISCUSSIONS

This table provides a comprehensive overview of the demographic characteristics of the study population. The mean age of the patients was 28.92 years, with a standard deviation of 12.81 years, indicating a relatively young population with considerable variability in age. The median age was 25 years, with an interquartile range (IQR) of 13.75 years, suggesting that half of the patients were between 18.13 and 31.88 years old. The study population consisted of 41 males (52.56%) and 37 females (47.44%), reflecting a nearly balanced gender distribution. These descriptive statistics provide a foundation for understanding the demographic profile of patients affected by Organophosphorus poisoning.

In this table, we compared the distribution of outcomes between male and female patients using a chi-square test. The analysis showed that males accounted for 52.56% of the study population, while females made up 47.44%. The mean age for males was 27.15 years with a standard deviation of 7.24 yearsfor females, it was 30.89 years with a standard deviation of 16.88 years. Despite the observed differences in mean ages, the chi-square test yielded a p-value of 0.20, indicating that there was no statistically significant difference in the distribution of outcomes between male and female patients. This suggests that gender does not significantly influence the likelihood of different outcomes in patients with Organophosphorus poisoning.

The table displays the frequency and percentage of different clinical signs observed in patients who have been affected by Organophosphorus poisoning. Out of the total number of patients, 53 showed miosis (pupil constriction), while 7 had normal pupils rest had dilation. Aspiration occurred in 25.6% of cases (20 patients), while the majority (74.4%, 58 patients) did not experience aspiration. 56.4% of patients exhibited crepitations, while the remaining 43.6% did not show this sign. These findings underscore the range of clinical presentations observed in patients with Organophosphorus poisoning and emphasise the significance of comprehensive clinical assessment.

This table compares the frequency and percentage of patients based on the time before presentation to medical care, categorized as either less than 6 hours or more than 6 hours. A significant majority, 60.26% (47 patients), presented within 6 hours of exposure, while 39.74% (31 patients) presented after 6 hours. The chi-square test revealed a p-value of 0.04, indicating a statistically significant difference in recovery times based on the time before presentation. This suggests that earlier presentation to medical care is associated with better recovery outcomes, emphasizing the critical importance of prompt medical intervention in cases of Organophosphorus poisoning.

The table details the frequency and percentage of treatments administered to patients with Organophosphorus poisoning. The data shows that 89.74% of patients received treatment, while 10.26% did not. This high rate of treatment administration reflects the critical importance of timely medical intervention in managing Organophosphorus poisoning cases.

This table compares the mean duration of hospital stay between patients who were discharged and those who died. The mean duration of stay for patients who were discharged was 5.06 days (SD = 2.22), whereas for those who died, it was 3.64 days (SD = 2.34). The results indicate that patients who survived tended to have a longer hospital stay compared to those who did not survive

The table summarizes the outcomes of patients with Organophosphorus poisoning, showing that 83.33% of patients were discharged, while 16.67% died. This outcome distribution underscores the severity of Organophosphorus poisoning and the critical need for effective treatment and management to improve survival rates.

This table examines the impact of receiving first aid on patient outcomes. Among patients who did not receive first aid, 13.51% died and 86.49% were discharged. For those who received first aid, 19.51% died and 80.49% were discharged. The chi-square test

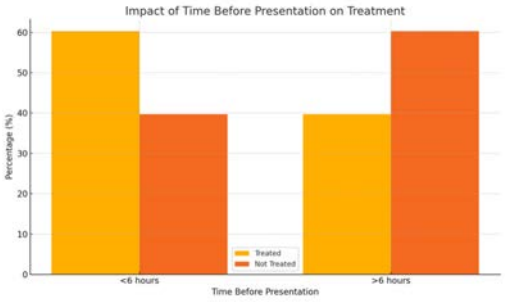

Fig. 1: Impact of Time Before Presentation on Treatment

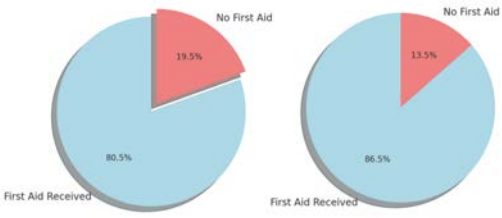

Fig. 2: Pie Chart for First Aid Impact on Outcomes

Table 1: Frequency Distribution

Variable	Category	Frequency (N)	Percentage (%)
Sex	Male	41	52.56
	Female	37	47.44
Age Group	0-10	0	0.00
	11-20	15	19.48
	21-30	33	42.86
	31-40	18	23.38
	>40	11	14.29

Table 2: Gender Distribution of Patients

Gender	Frequency	Percentage	Mean Age ± SD	p-value
Male	41	52.56%	27.15 ± 7.24	0.20
Female	37	47.44%	30.89 ± 16.88	0.20

Table 3: Frequency of Clinical Signs

Clinical Sign	Present (N)	Present (%)
Miosis	53	67.4
Aspiration	20	25.6
Crepitations	44	56.4

Table 4: Time Before Presentation

Time Before Presentation	Frequency	Percentage	p-value
<6 hours	47	60.26	0.04
>6 hours	31	39.74	

Table 5: Frequency of First aid Treatments Administered

Time Before Presentation	Frequency	Percentage
<6 hours	70	89.74
>6 hours	8	10.26

Table 6: Duration of Hospital Stay

Outcome	Mean Duration of Stay ± SD
Discharge	5.06 ± 2.22
Death	3.64 ± 2.34

Table 7: Patient Outcomes

Outcome	Frequency	Percentage
Discharge	65	83.33
Death	13	16.67

Table 8: Impact of Receiving First Aid

First Aid	Death Percentage	Discharge Percentage	p-value
N	13.51%	86.49%	0.69
Y	19.51%	80.49%	

yielded a p-value of 0.69, indicating no significant difference in outcomes based on whether first aid was administered. This finding suggests that while first aid is important, it may not significantly alter the overall outcome in the context of Organophosphorus poisoning.

According to the study findings, young adults around the age of 28.92 were found to be most affected by OP poisoning, with a fairly even distribution between genders. Seeking medical attention at the hospital within six hours was found to be strongly correlated with improved recovery outcomes (p = 0.04). Typical clinical indications consisted of miosis (67.4%) and crackling sounds (56.4%). Despite the relatively high rates of treatment administration, there was still a significant mortality rate.

The study population's demographic characteristics indicate that Organophosphorus (OP) poisoning primarily impacts young adults, with an average age of 28.92 years and an equal distribution between genders. Research supports the idea that young people engaged in agricultural activities face a greater chance of being exposed to OP compounds because these chemicals are commonly used in pest control[1]. It appears that individuals between the ages of 21-30 are more susceptible, possibly because of their involvement in farming activities. Breakdown of Patients by Gender There was no notable distinction in outcomes between males and females, as indicated by the p-value of 0.20. Previous studies have found that both genders are equally affected by the harmful effects of OP poisoning gender does not play a significant role in determining clinical outcomes[6]. The comparable average ages for males and females provide additional evidence of the equal impact of OP toxicity on both genders[7]. Incidence of Clinical Symptoms. The clinical signs observed in this study, including miosis (67.4%), aspiration (25.6%)crepitations (56.4%), are in line with the well-documented cholinergic symptoms of OP poisoning. It is crucial to identify specific clinical markers for prompt diagnosis and treatment[8]. It is crucial to closely monitor and provide necessary care for patients with OP poisoning due to the significant risk of respiratory complications[9]. Countdown to the Presentation A large majority of patients who arrived within 6 hours of exposure (60.26%) experienced more favourable

recovery outcomes, as evidenced by the p-value of 0.04. The significance of early medical intervention in cases of OP poisoning cannot be overstated. It reinforces the well-known principle that timely treatment leads to better outcomes and lower mortality rates[10]. Number of Treatments Given The treatment administration rate of 89.74% demonstrates the adherence to standard clinical practice of promptly initiating therapy in cases of OP poisoning. Following recommended protocols, it is advised to promptly administer antidotes like atropine and pralidoxime to counter the harmful impact of OP compounds[11]. Administering treatment promptly is essential for reducing the severity of poisoning and increasing the chances of survival[12]. Length of Hospitalisation Patients who were discharged had a longer mean duration of hospital stay (5.06 days) compared to those who died (3.64 days), suggesting that providing more intensive and prolonged care may lead to improved outcomes. Research has shown that keeping OP poisoning patients in the hospital for longer periods of time for close monitoring and treatment can be advantageous for their recovery[13]. Improving Patient Outcomes The data reveals a discharge rate of 83.33% and a mortality rate of 16.67%, underscoring the gravity of OP poisoning. Although there have been improvements in treatment, the high mortality rate highlights the importance of constantly enhancing preventive measures and treatment protocols[14]. The statistics highlight the need for efficient management strategies to decrease the number of fatalities caused by OP poisoning[15]. The Significance of Receiving First Aid There was no notable variation in outcomes depending on whether first aid was given (p-value of 0.69). Although first aid is important for providing immediate care, this study indicates that its effectiveness in improving overall outcomes may be limited without additional medical treatment. It is crucial to quickly transport and provide treatment at medical facilities for cases of OP poisoning[16]. According to the study, OP poisoning tends to impact young adults, with a fairly equal distribution between genders. It is crucial to quickly identify and address clinical signs like pupillary changes, aspiration crepitations in order to effectively manage them. Seeking prompt medical attention at the hospital greatly enhances the chances of a successful recovery, highlighting the crucial role of swift medical intervention. The significant frequency of treatment delivery highlights the importance of promptly implementing therapeutic interventions. Despite these efforts, it is clear that there is still much work to be done in improving treatment protocols and preventive strategies, as the mortality rate remains high. The analysis also emphasised the importance of first aid, but noted that it may not have a significant effect on overall outcomes without further medical intervention.

There are a few drawbacks to this study. As a retrospective study, it is important to consider the potential biases that may arise from medical record reviews, such as incomplete or inaccurate data entries. Additionally, it is important to note that the study was conducted at a single tertiary care hospital, which may impact the applicability of the findings to different settings or populations. Additionally, variations in treatment protocols across different time periods may have impacted the results. In addition, the study did not consider other factors that could have influenced the results, such as the presence of other medical conditions or the severity of poisoning when the patients were first seen.

CONCLUSION

Organophosphorus poisoning poses a significant threat to public health, especially among young adults engaged in agricultural work. Timely medical intervention and consistent treatment protocols play a vital role in enhancing patient outcomes. Despite the effectiveness of current treatments, there is still a considerable number of deaths, highlighting the importance of improving preventive measures and management strategies. Ongoing education and research play a crucial role in improving our understanding and treatment of OP poisoning. The ultimate goal is to decrease its occurrence and increase survival rates

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