



Evaluation of Recovery Rate in Poison Patients with or Without Standard Antidote Treatment

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aim: To evaluate the recovery rate of poisoning with regards to the availability and administration of standard antidote.

Introduction: Poison consumption is one of the most common causes of death across the world. The reason is its easy availability and impulsive behaviour associated with suicidal thoughts. Antidotes are the agents which counteract the harmful effects of poison. Poisoning can be treated with antidotes but not all poisons have antidotes, this study helps to analyze the effectiveness of antidotes in early recovery from poisoning accompanied by stabilization techniques implemented.

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Methodology: A prospective observational study was conducted in the inpatient department of General Medicine, Gandhi Hospital, Secunderabad from October 2021 to March 2022.

Results: Poison consumption was more predominant among males, and young adults are the most affected age group. Suicide was identified as the primary reason for poison intake, while accidental poison ingestion was mostly seen in children. Pesticides were the most commonly consumed poisons. The antidote was administered in approximately 33% of cases, while it was not provided in 15%. For the remaining cases, an antidote was not available. The overall recovery rate was 77%, with females showing higher recovery rates than males. Adolescents had the highest recovery rate, followed by middle-aged adults.

Conclusion: Our study concludes that the recovery was rapid in cases where a standard antidote was available and administered. Performing decontamination techniques within a few hours of poison consumption was also efficient.

Keywords: Poison; antidote; recovery rate; consumption.

1. INTRODUCTION

Poison is defined as a substance that is harmful to the body, and is either swallowed, inhaled, or absorbed through the skin. Commonly consumed poisons include prescription medications, over-the-counter drugs when consumed in higher doses, an overdose of narcotic substances, carbon monoxide, household products like laundry powder, furniture polish, pesticides, plants, heavy metals like lead, and mercury [1]. Antidotes are the substances that counteract the effect of a poison or toxin. They function by various mechanisms which may include preventing the absorption of toxin, binding to the toxin and neutralizing it, antagonising the effect of the poison on the target organ, and inhibiting the transition of poison into more harmful substances [2]. Poison consumption is one of the major causes of death in India. The reason can either be accidental or intentional. About 0.3 million people lose their lives due to various poisoning agents as per the reports of WHO [3]. Poisoning is more common in males than females [4]. Pesticide poisoning accounts for 1 in 7 deaths annually across the world. In India, about 38.8% of the poisoning cases are pesticide ingestion [5]. Organophosphorus poisoning is more frequently witnessed in South India, which consists of a significant population of farmers who regularly use organophosphorus compounds as insecticides. The widespread availability of these chemicals facilitates the high number of suicide cases reported in the area [6].

The recovery rate of poisoning depends on various factors like age, type of poison, antidote availability, immediate decontamination, and many more. Middle and low-income countries witness a higher incidence of pesticide exposure due to the escalated usage of agrochemicals in

agriculture [7]. The main objective of the study is to analyze the recovery rate in poisoning patients based on antidote administration and its availability. This study also helps in examining the reason for poison consumption and the age group that is commonly involved in poison consumption.

2. MATERIALS AND METHODS

The study was conducted in the in-patient Department of General Medicine in Gandhi Hospital, Hyderabad. We conducted a prospective observational study from October 2021 to March 2022.

Inclusion Criteria:

1. All the In-patients admitted to the Department of General Medicine with a confirmational diagnosis of Poison consumption of any type.
2. Age group between 1 to 80 years.
3. Both the genders.

Exclusion criteria:

1. Pregnant women.
2. Patients with HIV positive.

2.1 Collection and Analysis of the Data

We Prepared a structured documentation form for clinical study purposes. We visited the General medicine wards regularly for case collection and reviewed the collected cases according to the inclusion and exclusion criteria on a regular basis. The recovery rate based on the type of poisoning is measured in different age groups and both genders. A comparison of recovery when an antidote is given and not given was calculated. We Interpreted the data and

analyzed it to generate the final result. We used Microsoft Excel and SPSS software version 29 for the data analysis.

3. RESULTS

The sample size was 152 patients with 58.6% being male, among all the age groups young adults were more prone to poison consumption followed by middle-aged adults with 43.4% and 31.6% respectively. Pesticides excluding paraquat were consumed in the majority of cases followed by paraquat and phenol poisoning. The reason for poison consumption was suicidal in 80% of cases and accidental in 20% of cases. All the descriptive statistics for age, gender, length of hospital stay, and incidence rate are mentioned in Table 1. The incidence rate of pesticide poisoning was found to be 197 cases per 1000 population in a time period of 6 months. Figs. 1 and 2 represent the age distribution, and reason for poison consumption. Table 2 depicts the percentage of different types of poisoning and recovery rates. Qualitative analysis for

parameters like recovery, antidote administration, gender, and stabilization was done and is presented in Table 3. The P values to study the impact of age and length of hospital days on recovery are obtained by performing the Welch test. The P value for age was found to be 0.05 and for length of hospital stay was 0.03. The Spearman test was performed to analyze the correlation between the distribution of various types of poisoning and their recovery. The correlation coefficient was found to be 0.794 with a P value of 0.045.

A statistical analysis was performed to evaluate the effect of the antidote on recovery. The p-value for the Fisher Test was less than 0.01, indicating a statistically significant relationship between the antidote administration and recovery which is presented in Table 4. Fig. 3 illustrates the recovery rate based on antidote administration. A P value less than 0.05 is considered statistically significant. Fisher test for stabilization technique performed or not was done and the P value obtained was 0.02.

Table 1. Descriptive statistics for different types of poisoning

Types of poisoning	Age (Median)	Gender		Length of hospital stay (Median)	Incidence rate per 1000
		Male	Female		
Rat poison	32	60%	40%	7	65.7
Hair dye consumption	26	42.8%	57.1%	5	46
Sanitizer ingestion	30.5	58.3%	41.6%	6	78.9
Drug poison	31.5	25%	75%	8	78.9
Corrosive acid ingestion	40	66.6%	33.3%	8	78.9
Poisonous creature bite (Snake, Scorpion, Honey bee)	41	65%	35%	7	131.5
Paraquat poison	24	71.4%	28.5%	10	138
Pesticide poisoning	31	73.3%	26.6%	7	197
Phenol poisoning	30.5	57.1%	42.8%	9	92
Others	24	42.8%	57.1%	8	46

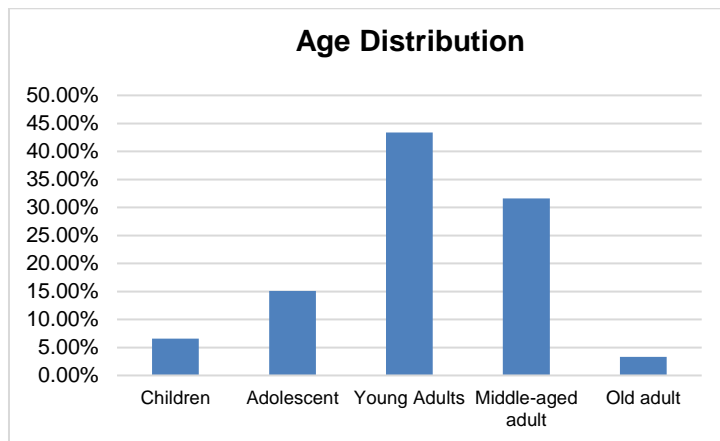


Fig. 1. Age-wise distribution of poison consumption

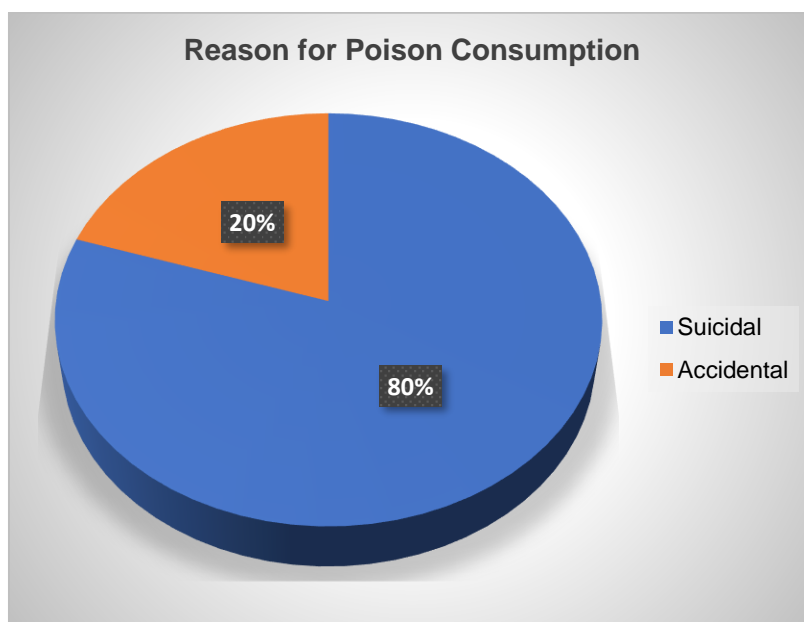


Fig. 2. Reason for consumption of poison

Table 2. Distribution of poisoning type and recovery rate

Type of poisoning	Percentage (%)	Recovery rate
Pesticide Poisoning	21.7	70%
Drug Poisoning	7.9	100%
Alcohol poisoning	7.9	91.6%
Hair dye poisoning	4.6	50%
Rat poisoning	6.6	50%
Paraquat poisoning	13.8	45%
Phenol poisoning	11.8	10%
Acid ingestion	7.9	52.6%
Poisonous creature	13.2	57%
Others	4.6	41%

Table 3. Qualitative analysis

Parameters	Subcategories	Percentage
Recovery	Yes	57%
	NO	43%
Antidote given/ not given	Not given	66%
	Given	29.6%
Gender	No Antidote	4.6%
	Male	61%
Stabilization	Female	39%
	Done	51%
	Not Done	49%

Table 4. Fisher Test to evaluate the effect of antidote in recovery

Recovery	Antidote not given	Antidote given	No available antidote
Yes	56%	36.2%	8.1%
No	79%	21%	0
P Value	<0.01		

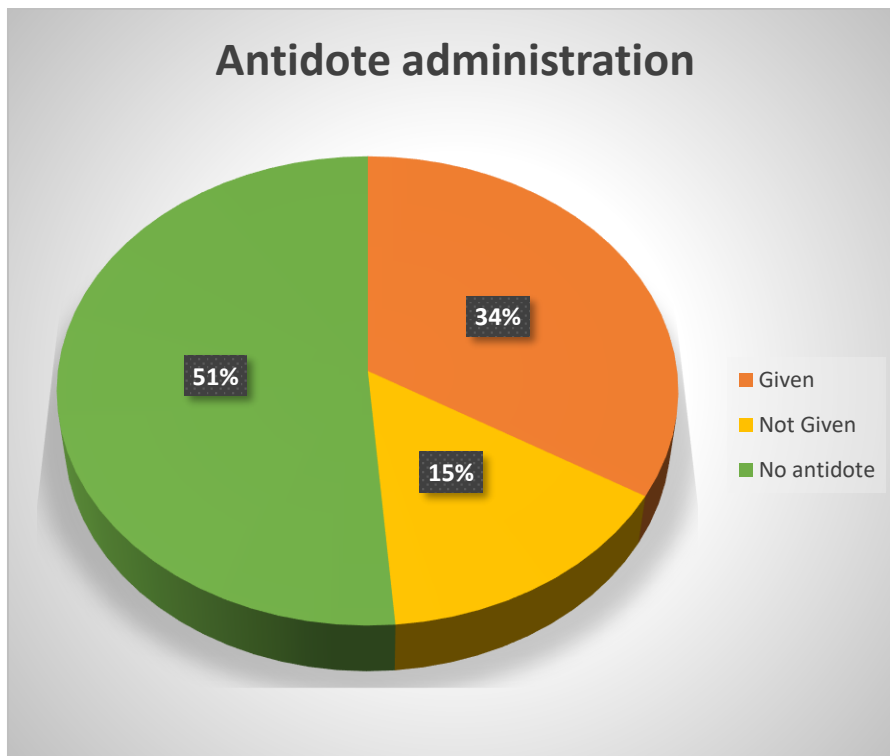


Fig. 3. Frequency Distribution of antidote administration

Antidote administration has a significant effect on recovery with an overall recovery rate of 77%. Recovery was also influenced by whether stabilization techniques were performed or not.

4. DISCUSSION

In our study, there were 89 male patients and 63 were female, indicating that poison consumption was more widespread among males than females. The highest rates of poison consumption were observed in young adults, while the lowest in older adults. This trend may be attributed to the greater social and familial pressures faced by young adults, which could make them more susceptible. These findings align with the study by Britt Reuter Morthorst et al. [8]. Among all the different types of poisons, pesticide consumption was the most predominant, due to the easy availability of pesticides. This finding is similar to the study conducted by Toby Bonvoisin et al. [9]. The main reason for poison consumption was found to be deliberate self-poisoning, due to the lack of attention on mental health in society. Accidental poisoning was mostly seen in children. This study is comparable to the study conducted by Young Choi et al. [10]. From our study about 50% of poisons do not have a standard antidote.

Among the remaining 50% of poisons that have an antidote, 15% of cases were not given an antidote due to the unavailability of an antidote or the physician's judgment. Our study shows an overall recovery rate of 77% and 23% of cases that have not been recovered. This may be due to various factors like age, gender, type of poison, antidote availability, and quantity of poison consumed. Our study is in contradiction to the study conducted by J. Jesslin et al. [11] where the recovery rate in our study is higher in females than that of the male. The recovery rate was more in adolescents (91%) followed by middle age adults (77%). The lowest recovery rate was seen in older adults which is 60%.

The recovery rate varies for each poison. The lowest recovery rate was seen in paraquat poisoning and almost 100% recovery rate was seen in rat and hair dye poisoning. Out of the 20 cases collected in paraquat ingestion, only one patient has been recovered. This was due to the immediate treatment given to the patient within one hour of poison consumption and decontamination procedures were performed. Rat poisoning had a 100% recovery rate but the ones who have been administered with vitamin K have recovered early than those who have not been administered with vitamin K. This study was

similar to the study conducted by E. Martin Caravati et al. [12]. Hair dye ingestion also had a 100% recovery rate but performing decontamination like gastric lavage and activated charcoal has shown a quick recovery. This study was similar to the study conducted by Jain et al. [13]. Acid ingestion has shown a 75% recovery rate. The recovery rate was affected by performing decontamination techniques like extracting acid through suction and gastric lavage. The recovery rate for drug poisoning was found to be 91.7%. The recovery was less in cases in which there was multiple drug ingestion. The availability of an antidote for some single drug ingestion made it easier for recovery. This study was similar to the study conducted by J. Fisher et al. [14]. Phenol ingestion had a recovery rate of 85%. Decontamination showed decreased absorption of phenol which increased recovery rate. Alcohol ingestion has become common in the recent pandemic times. Administration of the antidote showed a rapid recovery rate as decontamination techniques are not useful in this type of poisoning. This study was similar to the study conducted by Kenneth Mc Martin et al. [15]. The recovery rate in pesticide poisoning is very high due to the availability of an antidote and decontamination techniques that are effective. The recovery rate of pesticide poisoning in our study was 90%. This study was similar to the study conducted by Michael Eddleston et al. [16]. Poisonous creature bites are the leading cause of accidental poisoning. As most of them have a standard antidote there was a higher recovery rate. In these cases, anxiety and fear also play a major role in the recovery of the patient. This study was similar to the study conducted by Capan Konca et al. [17].

The Welch test was performed to analyze the impact of age and length of hospital stay on recovery. The P values obtained were 0.05 and 0.03 for age and length of hospital stay respectively. This implies that both factors have statistically significant effects on recovery. The Spearman correlation test, which examined the relationship between various types of poisons and recovery outcomes, yielded a correlation coefficient of 0.794 and a P value of 0.045. This indicates a strong positive correlation between the type of poisoning and recovery.

The effect of antidote administration on recovery was assessed using the Fisher test, which achieved a P value of 0.01. This clearly

demonstrates a statistically significant improvement in recovery with the use of antidote, as demonstrated in Table 4 and Fig. 3. The Fisher test for the impact of stabilization techniques showed a P value of 0.02, indicating a significant effect of stabilization on recovery.

The recovery rate was maximum in cases that had an antidote and the antidote was administered. In cases of no antidote, symptomatic treatment along with decontamination played a major role in recovery.

5. CONCLUSION

Our study concluded that the recovery rate was influenced by various factors like gender, age, type of poison, availability of an antidote, etc., Recovery was notably accelerated when an antidote was administered and stabilization techniques like gastric lavage, decontamination were carried out within a few hours of poisoning. Young adults were vulnerable to poisoning, with most cases being intentional self-poisoning. Paraquat poison had the lowest recovery rate among various types of poisons. Administration of an antidote often leads to a quick recovery. Deliberate self-poisoning is a major threat to society due to the lack of awareness of mental health and its importance.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

CONSENT

The data was collected with the consent of the patient from the case sheets. The results were obtained by performing a statistical analysis of the data collected.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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