

# An Epidemiological Profile of Poisoning: A Retrospective Study

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## Abstract

**Background:** Poisoning is acknowledged as a significant contributing factor to deaths in most of the low- income and middle income countries. Even though poisoning is regarded as a global burden, different parts of the world may experience different types of poisoning. For the purpose of creating and implementing appropriate policies to address this acknowledged public health issue, it is imperative to understand the epidemiology of poisoning cases in a given area. **Material & Method:** The present study was a retrospective study of poisoning deaths that were brought for medico legal autopsy at a tertiary care facility in southern Haryana between January 2018 and December 2023. A total of 264 medico legal autopsies for poisoning deaths were performed during the study period. Relevant information and subjective data like age, gender, marital status & occupation have been collected from medico legal autopsy register from January 2018 to December 2023.

**Results:** It was observed that out of 264 cases female outnumbered male in ratio 1.3:1. Majority of the victims belonged to the second and third decade of life. Married couples were more vulnerable and the majority of the victims (64.77%) had accidentally consumed poison.

**Conclusion:** The epidemiology of poisoning is highlighted in the study, which shows that poisoning fatalities accounted for almost 30% of total autopsies. Since the region is heavily dependent on agriculture, to control deaths caused by poisoning awareness programs should be implemented vigorously to educate and nurture the character of young people.

**Keywords:** Epidemiology; Autopsy; Poisoning; Suicide; Pesticides

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## Introduction

A poison is anything that, upon being introduced into the body or coming into contact with any body part, will cause harm or death by local or systemic action, or both. In reality, every substance has the potential to cause toxicity and every drug has the potential to be toxic when used erratically.<sup>1</sup> According to the WHO, about 640,000 people die each year from poisoning, with the majority of these deaths occurring in low and middle income countries. Unfortunately, the death rate from poisoning is much higher in developing countries compared to developed countries. The reasons for this discrepancy can be attributed to poor and prompt management of poisoning cases, awareness among the general public, preventive and regulatory measures. For instance, national data in India showed that 70,000 people died annually from poisoning, with a mortality rate of 2.4 per 100,000 population.<sup>2</sup>

Poisoning is one of the major epidemics of non-communicable diseases in the 21<sup>st</sup> century. Amongst the unnatural deaths, poisoning deaths are second to those caused by road traffic accidents. In the past, poisoning deaths caused by pesticides were mostly accidental. However, the easy availability, low price and unrestricted sale of pesticides have resulted in an increase in the number of suicidal cases as well.<sup>3</sup> The manner of poisoning varies depending on the age, and in the pediatric group, poisoning is usually caused by ingestion of commercial and household toxic products (usually out of curiosity), whereas in the adolescents and adults, deliberate self-poisoning is the most common type of poisoning.<sup>4</sup>

The prevalence of poisoning varies from region to region depending on several factors such as availability and access to poison, socio-economic and educational background, knowledge on pesticides and its use, etc. The rapid industrialization and large-scale use of pesticides in the agriculture sector, albeit in an uncontrolled way have increased the prevalence of poisoning. Pesticides are the most common cause of poisonings in India and many developing countries; the reason being agriculture-based economy, poverty, hazardous practices, illiteracy, lack of knowledge, inadequate protective gear, and easy access to highly toxic pesticides.<sup>5</sup>

Poisoning cases are common at our center as it is the only tertiary care facility in the area. So, the present study aims to gather demographic information about poisoning in this area as well as analyze the epidemiological profile of poisoning related deaths. In order to create and execute appropriate policies in addressing this under recognized public health concern and to reduce the burden of poisoning deaths in the society.

## Materials and Methods

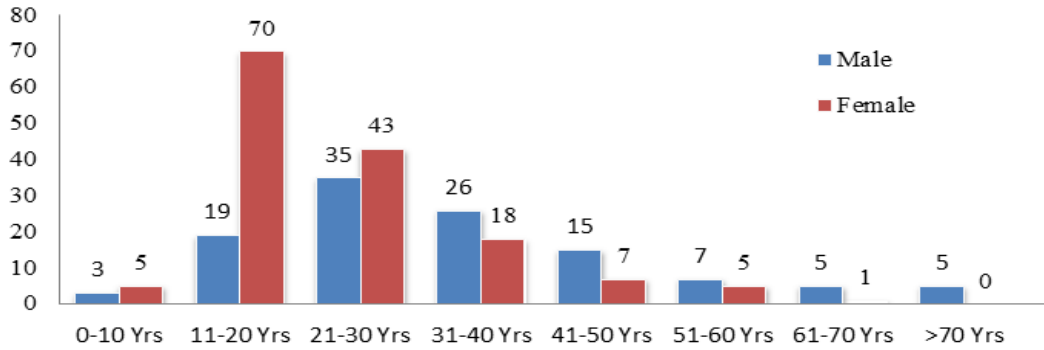
The present study was a retrospective study, carried out in the Department of Forensic Medicine of a tertiary care centre in southern Haryana, between January 2018 and December 2023. The study included 264 poisoning deaths autopsied between January 2018 and December 2023 at the aforementioned centre. This study comprised of hospital deaths and deaths in the jurisdiction of Nuh district alleged to have died due to poisoning. Relevant information and subjective data like age, gender, marital status, and occupation was collected from medico legal autopsy register while detailed information regarding the circumstances of the death was collected from inquest papers maintaining at most confidentiality. Data was collected and tabulated using a pre-designed format and the information thus collected, was statistically analyzed.

## Observations and Results

A total of 886 medico legal autopsies were performed between Jan 2018 to Dec 2023 at the study centre. Deaths due to poisoning comprised 264 cases i.e. an incidence of 29.79% among the total autopsies conducted during the study period.

In our study, it was observed that out of 264 cases, 149 were female (56.43%) and 115 were male (43.56%), the female outnumbered male in ratio 1.3:1. However, most of the deaths observed in females were at 11–20 years of age, while in males the majority of deaths were at 21–30 years of age. Nearly two-third of all the cases were in the 2<sup>nd</sup> to 4<sup>th</sup> decades of life. It was also, observed in the study that the age group of 11–20 years old accounted for maximum number of poisoning cases (33.71%), followed by the age groups of 21–30 years old (29.54%), 31–40 years old (16.66%) and least cases belonged to age group of above 70 years old (01.89%). Age-group wise gender-specific distribution of poisoning cases is depicted in Figure 1.

**Age & Gender Distribution**



**Figure 1: Age-group wise gender-specific distribution of poisoning cases (n=264).**

It was observed that the majority of cases of poisoning occurred in rural areas, with 82.57% of the victims coming from rural backgrounds and only 17% from urban areas. Also, 62.50% were Muslims being majority in number, followed by 37.50% Hindus. Incidence of poisoning was found more common

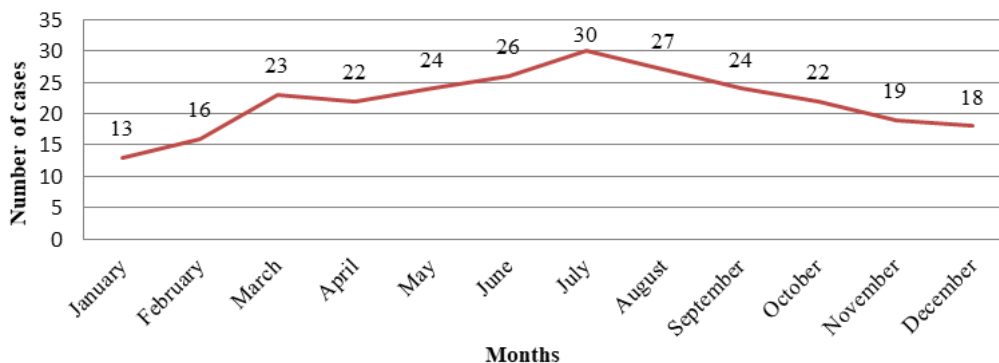
among married couples 59.84% (158) versus 40.15% (106) in unmarried. Majority of the victims (64.77%) had accidentally consumed poisonous substance, whereas 35.22% of the victims committed suicide by ingesting poison. Demographic attributes associated with poisoning cases are depicted in Table 1.

**Table 1: Showing Demographical attributes associated with poisoning cases.**

Demographical attributes	Poisoning cases	Percentage
Residence	Rural	218
	Urban	46
Religion	Hindu	99
	Muslim	165
Marital Status	Married	158
	Unmarried	106
Manner	Suicidal	93
	Accidental	171
	Homicidal	0

It was observed that maximum numbers of poisoning deaths (30) occurred in the month of July, followed by 27 deaths in August and least in the

month of January. The month wise distribution of poisoning deaths is depicted in Figure 2.



**Figure 2: Month wise distribution of poisoning deaths (n=264).**

In the present study occupation-wise distribution showed that poisoning is more common among people who are homemakers contributing 29.54%

cases, followed by workers (18.18%) and students (16.66%). The occupation wise distribution of poisoning deaths is depicted in Figure 3.

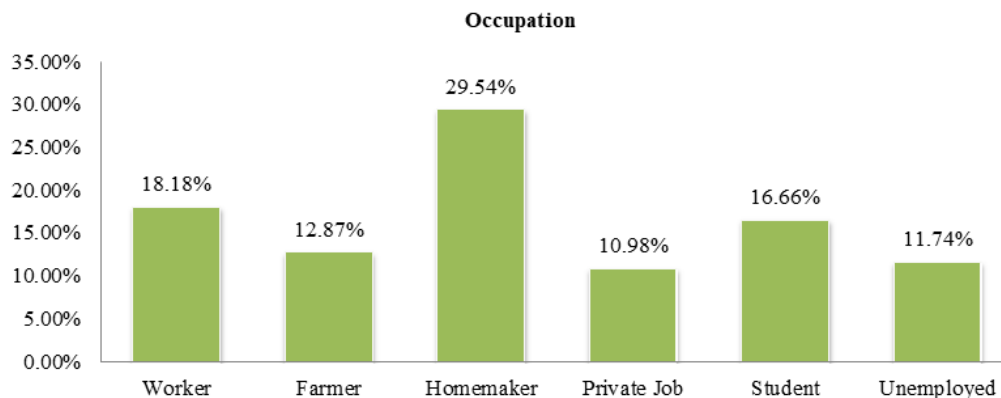


Figure 3: Occupation wise distribution of poisoning deaths (n=264).

### Discussion

Analysis of the data in the present study gives an incidence rate of 29.79% for death due to poisoning out of total 886 autopsies conducted during the study period. In the present study, poisoning death cases were higher in females (56.43%) than male deaths (43.56%), it was interesting to note that the majority of fatal cases occurred in females aged 11 to 40 years, and males aged 21 to 50 years. This difference indicates that females are more susceptible to poisoning in their second decade than males, and males are more susceptible than females in their fourth decade. The findings are in general agreement with the studies conducted by Parekh and Gupta<sup>2</sup>, Bhandari et al<sup>6</sup> and Rajesh et al<sup>7</sup>. The higher incidence of poisoning among females may be due to the fact that women are more likely to experience stress, tension, and struggle to manage family life with limited resources, domestic violence, unemployment, and behavioral issues. The findings of our study are contrary to those of Kirubakaran et al<sup>8</sup>, Selvam and Singh<sup>9</sup> and Mugadlimath et al<sup>10</sup> where males outnumbered females.

Present study showed that incidence of poisoning is more common in rural areas (n=218, 82.57%) than in urban areas (n=46, 17.42%). Rural population forms the major bulk of the population in Nuh district, also the majority of the rural population in Nuh district is dependent on agriculture. This makes them easily exposed to insecticides as well as susceptible to

animal-poisoned substances. This may be one of the reasons why the number of poisoning cases in rural areas was higher than urban areas in this study. The results are similar to the study conducted by Kirubakaran et al<sup>8</sup> and Mugadlimath et al<sup>10</sup>. In our study Muslims are the most affected (62.5%) than any other religion which may be attributed to the Muslim majority and the fact that maximum inhabitants of the region who are engaged in agriculture related occupations follow Islam. Findings of the study are contrary to the study done by Bhandari et al<sup>6</sup> and Mugadlimath et al<sup>10</sup> where most of the individuals affected were Hindus.

It was also observed that married couples were more vulnerable as compared to unmarried (59.84% versus 40.15%) Research shows that the marital status of the individual plays an important role. The desired bliss of marital life comes with many responsibilities and unexpected issues that require maturity, emotional, and psychological support. The inability to handle the marital responsibilities and the inability to resolve marital disagreement are some of the reasons that drive the individual to take extreme steps to end their life. Our observation was similar to the study of Bhandari et al<sup>6</sup>, Kirubakaran et al<sup>8</sup>, Mugadlimath et al<sup>10</sup> and Rajesh et al<sup>7</sup>. In present study maximum poisoning cases according to the manner of death are found to be accidental (n=171, 64.77%) followed by suicidal (n=93, 35.22%). During the study period, there were no reports of fatal homicidal poisonings, suggesting that poisonings

are no longer a preferred method of homicide in this area, similar to a study done by Kanchan et al.<sup>11</sup>

Present study showed that peak incidence of poisoning fatalities occurred during the months of June, July and August. The findings are similar to the study done by Parekh and Gupta<sup>2</sup>. However, in a study done by Kanchan et al<sup>11</sup> the month wise distribution of cases saw a peak incidence of poisoning fatalities in March and May. The cause of seasonal variations and month wise distribution of fatal poisoning cases remains unclear. Agricultural practices and availability of agrochemicals may have a contributory effect. Occupation-wise distribution showed that poisoning is more common among people who are homemakers contributing 29.54% cases. The high incidence may be because females are more exposed to stress. The findings are similar to the study done by Kirubakaran et al<sup>8</sup> and Bhandari et al.<sup>6</sup>

Limitation of the study: Limitations exist as they arise primarily from the fact that this is a retrospective record based study. A major limitation is that the study comprised of deaths alleged to have died due to poisoning. The particular substance or compound was not further identified. Toxicological analysis is required to further enhance the quality of epidemiological literature on poisoning in our area.

### Conclusion

The epidemiology of poisoning is highlighted in the study, which shows that poisoning fatalities accounted for almost 30% of total autopsies. The majority of victims were females in their second to fourth decade of life. This could be due to increased stress and responsibility at a younger age, the sensitive nature of the young population, economic challenges, unemployment and the easy availability of toxic and poisonous substances. Since the region is heavily dependent on agriculture, to control deaths caused by poisoning awareness programs should be implemented vigorously to educate and nurture the character of young people. Strict rules and regulations should be implemented to control over the counter sale of harmful and toxic agents. Retail products should be provided with information on the harmful side effects and fatal doses, as well as preliminary treatment and precautions to be taken in the event of accidental ingestion or exposure to the toxins.

**Conflict of interest:** None

**Ethical approval:** Prior permission was not taken from the IEC as it was a record-based study without involving any live subjects or experimentation.

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