

## ORIGINAL ARTICLE

## A 2 Years Retrospective Study of Spectrum of Poisoning in a Tertiary Care Centre in Karnataka

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**ABSTRACT**

**Background:** Poisoning remains a major public health and medico-legal problem worldwide, particularly in developing countries where toxic substances are easily accessible. The pattern of poisoning varies with geographical, occupational and socio-economic factors.

**Objectives:** To determine the proportion of poisoning deaths among all medico-legal autopsies and to analyze the spectrum of poisons responsible for mortality at a tertiary care centre in Chikkamagaluru.

**Materials and Methods:** A retrospective descriptive study was conducted on medico-legal autopsies performed over a period of two years from January 2023 to December 2024 at a tertiary care centre in Chikkamagaluru. Autopsy records, police inquest reports and chemical analysis reports were reviewed. Cases where poisoning was established as the cause of death were analyzed, and data was expressed as frequencies and percentages.

**Results:** Out of a total of 665 medico-legal autopsies, 100 cases (15.03%) were deaths due to poisoning. Organophosphorus compounds were the most common poisons implicated, followed by paraquat, pyrethroid and glyphosate. In a significant proportion of cases, the chemical analysis report was negative or inconclusive. Agricultural pesticides constituted the majority of poisoning deaths.

**Conclusion:** Poisoning accounts for a substantial proportion of medico-legal deaths in the region with agricultural pesticides being the predominant agents.

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Strengthening regulatory measures, improving public awareness and ensuring early medical intervention may help reduce poisoning-related mortality.

## KEYWORDS

• Organophorous • Pesticides • Paraquat • Pyrethroid • Medico-legal deaths

## INTRODUCTION

A poison is any substance which, when introduced into the body by any route, is capable of producing ill health or even death by its properties. Poisoning continues to be an important public health problem worldwide and accounts for a significant proportion of deaths every year.<sup>1</sup>

In India, poisoning constitutes an important cause of unnatural deaths due to the easy availability of toxic substances such as agricultural pesticides, herbicides, insecticides, rodenticides, industrial chemicals and household products<sup>2</sup>. Factors such as rapid agricultural expansion, increased use of chemical agents, inadequate regulation of toxic substances and lack of public awareness contribute substantially to the burden of poisoning-related deaths<sup>3</sup>. Socio-economic stress, mental health issues and easy access to poisons further increase the risk of intentional self-harm.<sup>4</sup>

The pattern of poisoning varies considerably with geographical location, occupational exposure, socio-economic conditions and cultural practices.<sup>5</sup> Rural and agrarian regions report a higher incidence of pesticide-related poisoning, while urban areas show relatively greater involvement of pharmaceutical drugs and household chemicals.<sup>6</sup> Seasonal variation has also been observed, with increased incidence during agricultural seasons when pesticides are readily accessible.<sup>7</sup>

Poisoning cases often present as medico-legal emergencies and may be suicidal, accidental or rarely homicidal in nature. The clinical outcome depends on multiple factors including the type of poison, dose, route of exposure, co-ingestion of other substances such as alcohol, and the time interval between exposure and initiation of treatment. Delayed presentation to healthcare facilities, especially in rural areas, significantly increases mortality despite available treatment protocols.<sup>8</sup>

Medico-legal autopsy plays a pivotal role in determining the cause of death in suspected poisoning cases. Autopsy findings, when correlated with circumstantial evidence and chemical analysis reports, provide definitive information regarding the nature of the poison and the manner of death. Autopsy-based studies therefore serve as an important source of epidemiological data, reflecting the true magnitude and pattern of poisoning deaths in a particular region.<sup>2</sup>

Understanding the regional spectrum of poisoning deaths is essential for planning preventive strategies, strengthening regulatory policies and improving early diagnosis and management of poisoning cases.<sup>1</sup> Such data also aid forensic experts, clinicians and public health authorities in identifying commonly used poisons and emerging trends over time.<sup>5</sup>

Chikkamagaluru district, being predominantly agricultural in nature, is expected to exhibit a distinct pattern of poisoning deaths with a predominance of pesticide-related toxicity. However, there is limited published literature documenting the spectrum of poisoning deaths from this region. The present study was therefore undertaken to analyze the proportion of poisoning-related deaths among all medico-legal autopsies and to study the spectrum of poisons responsible for mortality at a tertiary care centre in Chikkamagaluru over a period of two years. The predominance of pesticide-related poisoning in the present study reflects the predominantly agricultural nature of the Chikkamagaluru region.

## MATERIAL AND METHODOLOGY

*Study design:* Retrospective analytical study

*Study material:* Autopsies conducted during the study period.

A total of 665 autopsy reports were studied that was conducted in a span of 2 years from 1st

January 2023 to 31st December 2024 in a tertiary care centre, Chikkamagaluru. The study was conducted after obtaining Institutional Ethical Clearance. It was a retrospective analytical study with secondary data obtained from medical records. After perusing the facts provided by the police, complete medico legal autopsy was done in each case, along with relevant histo-pathological examination to arrive at a conclusion about the cause of death. Other samples like blood, Portion of liver and half of each kidney were sent to Forensic Science Laboratory for detection and quantification of poison consumed by the deceased. Reports from the Forensic Science Laboratory were analyzed. Frequency and percentages were computed using Microsoft excel in this survey.

## RESULTS

During the study period of from January 2023 to December 2024, a total of 665 medico-legal autopsies were conducted at tertiary care centre, Chikkamagaluru. Poisoning constituted a significant proportion of medico legal deaths during the study period. Among them, 57 in 2023 & 43 in 2024 were poisoning deaths which added up to 100 cases (15.04%) attributing to poisoning and formed the study group. This data is shown in Table 1. Thus poisoning related deaths accounted for approximately one-sixth of all cases, highlighting poisoning as an important cause of mortality in the region.

Analysis of the 100 poisoning deaths along with the Forensic Science Laboratory reports of the concerned deceased revealed a wide spectrum of toxic agents involved. Among all, Organophosphorous compound poisoning was the most common cause, accounting for 41 cases (41%). This category also included cases where Organophosphorous compounds were consumed along with alcohol. In 20 cases (20%), the chemical analysis report was negative or inconclusive and the poison could not be identified. These cases were categorized separately as unknown poisoning, despite strong circumstantial and autopsy findings suggestive of poisoning. Paraquat poisoning constituted 10 cases (10%), followed by pyrethroid poisoning in 7 cases (7%) and glyphosate poisoning in 5 cases (5%). Rodenticides including yellow or white phosphorus compounds were responsible for 4 cases (4%), while Corrosives accounted

for 3 deaths (3%). Ethanol poisoning and organochlorine insecticide poisoning including lindane, was observed in 2 cases (2%) each. The distribution of poisons is shown in the charts 1 & 2.

Rare causes of poisoning included Carbon monoxide poisoning, Carbamate poisoning, pharmaceutical drug poisoning, Fungicidal poisoning, Cyanide poisoning, and other herbicides poisoning accounted for 1 case (1%) each.

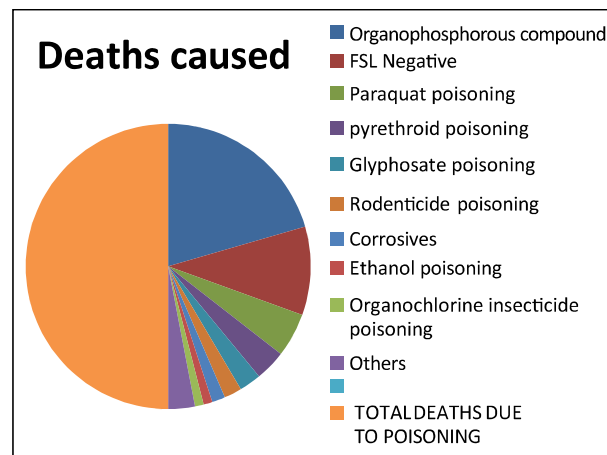
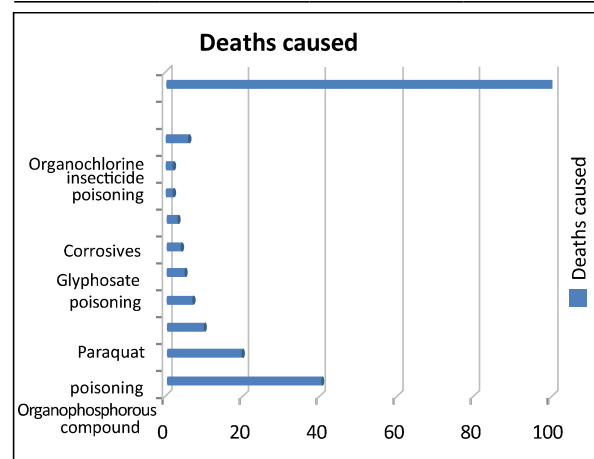


Table 1:

Year	Total autopsies	Poisoning deaths	Percentage
2023	330	57	17.27%
2024	335	43	12.83%



## DISCUSSION

Poisoning continues to be a significant cause of unnatural deaths in both developing and developed countries. In India, it represents a major public health concern due to the widespread availability of toxic substances,

particularly agricultural chemicals.<sup>9</sup> Easy access to pesticides, coupled with socio-economic stressors and limited awareness regarding their hazards, contributes to the high burden of poisoning-related mortality.

The predominance of pesticide-related poisoning observed in many Indian studies reflects the agrarian nature of large parts of the country. Insecticides, herbicides and rodenticides are readily available, often without strict regulatory control, making them common agents used in both intentional and accidental poisoning. Among these, organophosphorus compounds have traditionally been reported as the most frequently implicated poisons due to their widespread use and high toxicity. Despite increasing awareness and regulatory efforts, these compounds continue to pose a major risk to public health.<sup>10</sup>

Herbicides such as paraquat and glyphosate have emerged as important contributors to poisoning-related mortality. Paraquat, in particular, is associated with a high fatality rate due to severe pulmonary and multi-organ toxicity, even when ingested in small quantities. The increasing use of such herbicides in agricultural practices highlights the need for strict regulation and controlled distribution.<sup>1</sup>

In several poisoning cases, identification of the specific toxic agent may not be possible despite detailed autopsy examination and chemical analysis. Negative or inconclusive toxicological reports have been attributed to factors such as delayed death, degradation of the poison, inadequate sampling or prior medical treatment. Nevertheless, circumstantial evidence and autopsy findings often provide sufficient information to establish poisoning as the cause of death.<sup>11</sup>

Non-pesticide poisons, including corrosive substances, pharmaceutical drugs, alcohol and gaseous poisons, contribute to a smaller proportion of poisoning deaths. Corrosive poisons produce characteristic local tissue damage, while pharmaceutical drug poisoning often results from overdose or misuse. Alcohol poisoning, though less frequently reported as a direct cause of death, remains an important toxicological entity. Gaseous poisons such as carbon monoxide and highly lethal agents like cyanide, though rare, are of significant medico-legal importance due to their rapid and fatal effects.<sup>12</sup>

Autopsy-based studies provide valuable insights into the true spectrum of poisoning deaths, especially in regions where hospital-based data may underestimate mortality due to underreporting or misclassification.<sup>13</sup> Such studies help in understanding regional trends, identifying commonly used poisons and recognizing emerging toxicological patterns over time.<sup>14</sup>

The findings of the present study emphasize the need for effective preventive measures, including stricter regulation of toxic substances, public education regarding the hazards of poisoning and timely medical intervention. Strengthening poison information centers and improving access to healthcare facilities in rural areas may further reduce poisoning-related mortality.<sup>15</sup>

## CONCLUSION

Poisoning constitutes a significant proportion of medico-legal deaths in Chikkamagaluru district. Organophosphorus compounds remain the most common cause of poisoning-related mortality, followed by herbicides such as Paraquat and glyphosate. Agricultural pesticides continue to dominate the spectrum of poisons encountered in this region.

The findings highlight the need for stricter regulation of pesticide availability, increased public awareness regarding the hazards of toxic substances and early medical intervention in poisoning cases. Autopsy-based studies such as this provide valuable insight into regional poisoning trends and can aid in planning preventive and control measures.

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