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Case Study

A five years study on poisoning cases brought for medico-legal autopsy in a tertiary care centre of northeast of India

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Abstract:

Aims and Objectives: The present study aims to investigate the prevalence, patterns and trends of poisoning cases brought for medico-legal autopsy in a tertiary care centre in Northeast India over a five-year period.

Materials and Methods: This is a retrospective hospital record-based study. The study population includes all cases of suspected poisoning brought for medico-legal autopsy to the Department of Forensic Medicine & Toxicology, Assam Medical College & Hospital, Dibrugarh, Assam, India during the study period from 1st January 2016 to 31st December 2020.

Results: A total of 355 positive cases of deaths due to poisoning were studied during the study period of 5 years from 1st January 2016 to 31st December 2020. In the present study, Organophosphate was found to be the most common poison used with 162 cases (45.63%) followed by drug abuse/over dose.

Conclusion: The findings of the study emphasize the crucial role of forensic investigations in identifying the causes of poisoning related deaths, as well as the importance of timely and accurate medical intervention in such cases. Further research is required to better understand the specific factors contributing to the high incidence of poisoning deaths in the region & develop effective interventions to reduce this burden.

Keywords: Poisoning; insecticide; organophosphates; drug abuse; autopsy; death.

Introduction:

Poison is a 'substance which endangers life by severely affecting one or more vital functions' [1].Poisoning deaths are a significant public health concern as they result in high number of fatalities worldwide. Poisoning can occur due to exposure to various harmful substances including drugs, chemicals and natural toxins. In 2016, the World Health Organisation reported approximately 346,000 unintentional poisoning deaths worldwide, with opioids being the most common [2]. Intentional poisoning, such as suicide or homicide, can also have a severe impact on individuals and community's mental health. According to the National Crime Records Bureau, a total of 38,493 deaths due to poisoning were reported in India for the year 2019[3]. Poison has been known and utilized throughout history, dating back to ancient civilizations like Egypt, Greece and Rome. Notable use of poison in ancient times includes the death of Socrates, who drank hemlock as a means of execution [4].

The WHO reports that highest burden of poisoning deaths occurs in low and middle income countries, with the greatest risk among young people aged 15-29 years [5]. According to WHO, poisoning is responsible for approximately 355,000 deaths annually, with the majority

occurring in low and middle income countries [6].

The state of Assam had recorded 1,042 deaths due to poison in previous five years(2014-2018]. The most common types of poisons used in these cases were agricultural chemicals, household cleaners and pharmaceutical drugs [7].

Several factors contribute to the risk of poisoning deaths, including gender, age, socioeconomic status and geographical location. Some areas may have a higher prevalence of certain toxic substances, increasing the likelihood of poisoning deaths. Inadequate health care access, a lack of awareness about toxic substances dangers & limited resources for toxicology testing also contribute to the risk of poisoning deaths.

In India, poisoning is a significant problem, and it is one of the leading causes of deaths in particularly in rural areas. The north-eastern region of India is known for its rich biodiversity and ethnic diversity and is agricultural rich and dependent region.

The present study aims to investigate the prevalence, patterns and trends of poisoning cases brought for medico-legal autopsy in a tertiary care centre in Northeast India over a five-year period. The study will provide valuable information on the characteristics of poisoning cases in this region and contribute to the development of effective prevention and intervention strategies.

The research publication aims to analyze the incidence and trends of poisoning deaths in a specific location and identify the most common substances, age group, sex, and socio-economic status, area of habitat and job profile responsible for these deaths. By identifying the factors contributing to poisoning deaths, the study aims to inform public health policies and interventions that can effectively reduce the burden of poisoning on individuals and communities.

Materials and Methods -

This is a retrospective hospital record-based study. The study was conducted in a tertiary care centre of Northeast, India. The study period was from 1st January 2016 to 31st Dec. 2020. The study population includes all cases of suspected poisoning brought for medico-legal autopsy to the Department of Forensic Medicine & Toxicology, Assam Medical College & Hospital, Dibrugarh, Assam, India during the study period.

Inclusion Criteria :

All cases of suspected poisoning brought for medico-legal autopsy and whose positive toxicological analysis reports received from Forensic Science Laboratory, Kahilipara, Guwahati, Assam in our department during the study period were included in the study.

Exclusion Criteria:

Cases of suspected poisoning whose chemical analysis reports of viscera are not received from Forensic Science Laboratory, Kahilipara, Guwahati, Assam and cases of natural deaths, trauma and other causes of death unrelated to poisoning were excluded from the study.

Data collection:

The data were collected from the hospital records of the Department of Forensic Medicine & Toxicology, Assam Medical College & Hospital after getting proper authority letter to use the departmental data for the research publications from the head of the institution (Principal-cum-Chief Superintendent).

Data analysis:

Data were collected into a computer database and analyzed using appropriate statistical methods. Descriptive statistics was used to analyze the data.

Ethical Consideration -

The study was conducted in accordance with the Declaration of Helsinki and ethical guidelines. The study protocol was submitted to the Institutional Ethics Committee, Human (IECH) for approval and study was started after getting Ethical clearance from IECH, Assam Medical College & Hospital, Dibrugarh. The study was conducted without any personal identifier to maintain confidentiality.

Results -

A total of 355 positive cases of deaths due to poisoning were studied during the study period

of 5 yrs from 1st January 2016 to 31st Dec. 2020. The following results were found in the study-

Gender- Male victims with 215 cases (60.56%) were more than females with 140 cases (39.44%).

Age- Most of the victims belong to the age group of 20-30 years (123 cases, 34.65%) followed by 30-40years (73 cases, 20.56%). Distributions of poisoning cases according to different age groups are shown in Table 1.

Table 1. Distribution of the study population according to Age

Age (in years)	Frequency	Percentage (%)
0-10	4	1.13
10-20	51	14.37
20-30	123	34.65
30-40	73	20.56
40-50	50	14.08
50-60	37	10.42
Above 60	17	4.79
Total	100	100.0

Religion- Majority of victims were of Hindu religion with 257 cases (72.39%) followed by Muslim (21.69%) and others (5.92%).

Marital Status- The study shows that married cases were more (208 cases, 58.59%) as compared to unmarried cases (147 cases, 41.41%).

Habitation- Most of the victims in this study were from rural habitat with 218 cases (61.41%) compared to urban habitat (137 cases, 38.59%).

Socio-economic Status- Maximum affected people belong to lower socio economic status with 288 cases (81.13%). Distribution of poisoning cases as per socio-economic status is shown in Table 2.

Table 2. Distribution of the study population according to Socio Economic Status

Socio Economic Status	Frequency	Percentage (%)
Upper	11	3.10
Middle	56	15.77
Lower	288	81.13
Total	355	100

Manner of Poisoning- In the present study, the incidence of suicidal cases were highest with 348 cases (98.03%). Distribution of poisoning cases according to manner of poisoning is shown in Table 3.

Table 3. Distribution of the study population according to manner of poisoning.

Manner	Frequency	Percentage (%)
Suicidal	348	98.03
Accidental	7	1.97
Homicidal	0	0
Total	355	100.0

Occupation- The incidence of poisoning cases were highest among the persons related to agriculture sector including farmers with a total of 214 cases (60.28%) followed by Unemployed. Distribution according to Occupation is shown in Table 4.

Table 4. Distribution of the study population according to Occupation

Occupation	Frequency	Percentage (%)
Agriculture	214	60.28
Unemployed	97	27.32
Government	8	2.25
Private	2	26.20
Self-employed	12	3.38
Others	2	0.56
Total	355	100.0

Type of Poisons - In the present study, Organophosphate was found to be the most common poison used with 162 cases (45.63%) followed by drug abuse/over dose. Distribution

according to types of poison is shown in Table 5.

Table 5. Distribution of study population according to type of poison

	Frequency	Percentage (%)
Organophosphorus	162	45.63
Drug abuse/ overdose	57	16.06
Carbamate	41	11.55
Kerosene	28	7.89
Ethyl Alcohol	24	6.76
Organochlorine	21	5.92
Mushrooom	15	4.23
Snake Bite	6	1.69
Glyphorate	1	0.28
Total	355	100

Discussion- The north-eastern region of India is a agricultural rich area with a large rural population, making agricultural poisons easily accessible. This accessibility may be the primary reason for the high incidence of poisoning-related deaths in the region.

In this study, male victims comprised the majority of cases with 215 incidents (60.56%), while female victims accounted for 140 cases (39.44%). Male: Female ratio is 1.54:1. Several factors could contribute to the higher incidence of poisoning-related deaths among men, including occupational exposure to toxic substances, greater propensity for risk-taking behaviour, biological differences in metabolism and body mass and disparities in access to health care. Similar findings were found in studies done by Sharma R et al, Haloi M et al, Vijay V and Kumar P, Jesslin J et al, Mate V. [8, 9, 10, 11, 12].

In our study it was found that, maximum number of poisoning cases were in the age group of 20-30 years with 123 cases (34.65%) followed by 30-40 years with 73 cases (20.56%). Least number of cases were seen in extreme of ages, i.e. between 0-10 years (1.13%) and above 60 years (4.79%). The young age group is typically more involved in occupations that exposes them to toxic substances such as chemicals, pesticides etc increasing their risk of poisoning. At this age group, may experience high level of stress, depression, anxiety, leading to suicidal thoughts and attempts, which can involve poison. Moreover, in this young age group, they are more likely to experiment with drugs, alcohol and other toxic substances, which can lead to accidental or intentional poisoning similar findings were found in studies done by Sharma R et al, Haloi M et al, Vijay V and Kumar P, Mate V, Patil A et al, Mlayeh S et al. [8, 10, 11, 12, 13,14].

Maximum numbers of victims were Hindu followed by Muslim. This may be due to Hindu predominant region. Similar findings were found in studies done by Vijay V and Kumar P, Sylvia S, Patil A et al, Kumar and Pathak MK [11, 15, 16].

In our study we found that victims of death due to poisoning are more in married people compared to unmarried people. Several factors could contribute to a higher incidence of poisoning deaths among married person due to marital stress, domestic violence or financial strain. Similar findings were found in studies done by Patil A et al, Sylvia S, Kumar and Pathak MK, Infant Raj AD, Dash SK et al [13,16,17,18].

In our study most of the cases were reported from rural areas. The possible contributing factors may be due to greater use of pesticides in agricultural settings in rural areas, which often occurs without adequate safety precautions or protective gear, leading to higher rates of pesticide-related poisoning. Another potential factor is limited access to healthcare facilities and emergency services in rural areas, which can lead to delayed or inadequate treatment for poisoning cases. The National Crime Bureau (NCRB) of India reports that poisoning deaths are more prevalent in rural areas. In 2019, there were 23,029 recorded cases of poisoning death in India, with 15,191 (66%) occurring in rural areas and 7,838 [34%) occurring in urban areas Similar findings were found in studies done by Haloi M et al, Patil A et al, Chaudhari VA et al, Chaterjee S et al, Acherjya GK et al [10,13,19,21,22].

In our study it was found that, maximum number of victims belongs to lower socio-economic class with 288 cases (81.13%) followed

by middle class with 56 cases (15.77%). This may be due to financial crisis, depression, limited access to healthcare facilities, lack of education and awareness about the risks associated with toxic substances, occupational hazards as most of them engage in works related to agriculture, mining or factory works making them more exposed to toxic substances and family disharmony in lower class of people. Similar findings were found in studies done by Patil A et al, Sylvia S, Infant Raj AD, Das A et al, Pate RS et al [13, 17, 23].

The most common manner of poisoning in our study was found to be suicidal with 348 cases (98.03%) followed by accidental poisoning with 7 cases (1.97%) . Similar findings were found in studies done by Acherjya GK et al, Kumar Mu et al, Indu TH et al, Shetty AR et al [20,22,25,26].

Majority of victims due to poison were farmers or agriculture-related workers with 214 cases (60.28%) followed by unemployed with 97 cases (27.32%). Similar findings were found in studies done by Patil A et al, Chaudhari VA et al, Das A et al, Kumar MU et al [13, 19, 23].

The most common poison causing deaths was found to be Organophosphorus with 162 cases (45.63%) followed by drug abuse/overdose with 57 cases (16.06%). As Northeast of India is an agricultural rich area and most of the inhabitants depend primarily on agriculture, so pesticides/insecticides are widely used and easily available. Similar findings were found in studies done by Haloi M et al, Goswami O et al, Ahmed M et al, Dash SK et al [10, 28, 29, 31].

Conclusion-

This study conducted over a period of five years on poisoning cases brought for medico-legal autopsy in a tertiary care centre of Northeast India revealed a significant burden of poisoning related mortality in the region. Self poisoning was found to be the most common cause of poisoning deaths, with organophosphates pesticide being the most commonly used agent. The study highlights the need for targeted prevention efforts among vulnerable populations such as young adults and women.

The findings of the study emphasize the crucial role of forensic investigations in identifying the causes of poisoning related deaths, as well as the importance of timely and accurate medical intervention in such cases. Further research is required to better understand the specific factors contributing to the high incidence of poisoning deaths in the region and develop effective interventions to reduce this burden.

Conflict of Interest - No conflict of interest.

Limitation-

The study on poisoning cases brought for medico-legal autopsy in a tertiary care centre of Northeast India has some limitations that should be noted. Firstly, the study was conducted in a single centre and may not fully representative of broader population of Northeast India. Additionally, the retrospective nature of the study means that the findings relied on existing medical records, which may not have captured all relevant information about the poisoning cases. Furthermore, the study was limited to cases that were brought for medico-legal autopsy, potentially excluding cases that were not referred for autopsy or not detected by authorities.

Moreover, the study was conducted over a five-year period, during which changes in medical practices, facilities and policies related to poisoning may have influenced the findings. Finally, the study did not delve into root causes of the high incidence of self-poisoning cases in the region, and further research is necessary to better understand the factors contributing to this trend [9, 10, 11].

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