

ORIGINAL RESEARCH PAPER

PROFILE OF FATAL POISONING IN AUTOPSY CASES AT A TERTIARY CARE HOSPITAL IN PORT BLAIR (ANDAMAN AND NICOBAR ISLANDS): A SEVEN-YEAR RETROSPECTIVE STUDY

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ABSTRACT

Poisoning is a significant worldwide public health concern. According to the National Crime Records Bureau (NCRB) 2022 report, there is an increase in the number of suicides and suicide rate in India, in 2022 from 2021. The present study was a retrospective study conducted to determine the profile of fatal poisoning. A total of 65 fatal poisoning cases brought for autopsy at the Mortuary of the Department of Forensic Medicine & Toxicology, ANIIMS & G.B. Pant Hospital, Port Blair, Andaman & Nicobar Islands from January 2016 to December 2022 were analyzed. Gender-wise, the victims included 49 (75.4%) males and 16 (24.6%) females, the majority of whom were married. The maximum poisoning

fatalities were observed in the age group of 31–40 years. Cases were relatively higher in rural (52.3%) areas than in urban (47.7%) areas. The most frequently observed was paraquat poisoning, with 21 (32.3%) cases. Most of the poisonings were suicidal in manner and happened at the residences of the deceased. A higher incidence of poisoning was observed during the daytime. The maximum number of poisoning cases was in January. Most cases were noted during October to January, constituting 29 (44.6%) cases. The highest number of deaths occurred during the year 2021. Almost all cases involved exposure to the poison through ingestion, except one. The most frequent survival period was more than 48 hours. Occupation-wise, most of the deceased were employed in private jobs. The most common stressors of fatal poisoning documented were due to domestic issues.

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INTRODUCTION

A poison is a substance that, if introduced into the living body or brought into contact with any part thereof, will produce ill health or death by its constitutional or local effects or both.¹ Poisoning is a significant worldwide public health concern. According to the National Crime Records Bureau (NCRB) 2022 report, there is an increase in the number of suicides in India, from 1,64,033 cases in 2021 to 1,70,924 cases in 2022, with an increase in suicide rate from 12.0 in 2021 to 12.4 in 2022. Consuming poison is the second most common means of committing (25.4%) in India after hanging (58.2%). A total of 4,22,444 accidental deaths have happened in India in 2022. Poisoning constituted 5.1% of unintentional deaths due to causes other than forces of nature. In contrast, in 2021, it constituted 6% of such deaths, whereas it was 4.9% in 2020.²

Since farming is a common occupation in rural India, farmers use pesticides to eliminate weeds and other unwanted vegetation. Because pesticides are readily available, people frequently use them to take their own lives. Agricultural poisons like organophosphorus compound (OPC) are the primary cause of deliberate poisoning deaths.³ Suicidal poisoning generally affects

young adults more frequently than accidental poisoning, which typically affects children.⁴

To assess and analyze deaths caused by a variety of poisons, it is increasingly essential to consider medicolegal autopsies. Periodic autopsy studies on poisoning deaths would significantly help in monitoring the impact of prevention or treatment interventions and for the assessment of any specific mortality patterns in such poisoning. Though studies on the profile of poisoning fatalities are present in most of the regions of India, no data concerning is available for the Andaman and Nicobar Islands in literature to date. The current study attempts to fill this gap in this region of India. The findings of this study will help determine the underlying contributing elements of such deaths. Public authorities and law enforcement agencies could equally benefit from the data generated to raise public awareness and implement the appropriate preventative measures to stop or manage such poisoning deaths.

MATERIALS AND METHOD

The present study was a retrospective study conducted for seven years, from January 2016 to December 2022. A total of 65 fatal poisoning cases brought for autopsy at the Mortuary of the Department of Forensic Medicine and Toxicology, ANIIMS & G. B. Pant Hospital, Port Blair, Andaman and Nicobar Islands from January 2016 to December 2022 were analyzed. Prior approval from the Institutional Ethics Committee was obtained for conducting the study (ANIIMS/IEC/2022-23/41). Cases of deaths due to snake bites or insect bites, food poisoning, and due to allergic reactions to some drugs were excluded from the study. Preliminary data like data regarding age, sex, marital status, occupation, religion, locality, type of poison, time and month of intake, season, route of exposure, survival period, and manner of death were collected from postmortem reports, police inquest, histopathology report, and chemical analysis of the viscera report. All the information mentioned above was compiled using an anonymized data collection proforma. The obtained data were tabulated in Microsoft Excel and analyzed using a descriptive statistical method using IBM SPSS software.

RESULTS

Profile of poisoning cases among the medicolegal autopsies

From January 2016 to December 2022, 1464 medicolegal autopsies were conducted in the Mortuary of the Department of Forensic Medicine and Toxicology, ANIIMS & G. B. Pant Hospital, Port Blair, Andaman and Nicobar Islands, of which 65 cases (4.4%) were of fatal poisoning.

Demography

A cumulative of 65 reported cases of fatal poisoning

underwent postmortem examination between the years 2016 to 2022. There were 49 (75.4%) males and 16 (24.6%) females. The majority (56 cases) were Hindus, followed by five in Christianity, three in Muslim, and one in Sikh.

Age group-wise distribution

The deceased individuals in the present study ranged from 3 to 87 years. The maximum poisoning fatalities were observed in the age group of 31–40 years, which accounted for 15 (23.1%) cases, followed by 11 (16.9%) cases in each of the age groups 21–30, 41–50, and 51–60 years. The least distribution of one case (1.5%) each was observed in the age groups of 0–10 years and 71–80 years (Figure 1). Among all the age groups, male poisoning cases were more than female, except in the 11–20 years, where male and female poisoning fatalities were in equal numbers. The majority of cases of fatal poisoning among males were in the age groups of 31–40, 41–50, and 51–60, with 10 cases each. Therefore, the majority of the male poisoning cases (61.2%) were between 31–60 years of age. The majority of cases of fatal poisoning among females were in the age groups of 11–20 and 31–40 years, with five cases each, followed by three cases in the 21–30 years age group. Therefore, the majority of the female poisoning cases (81.3%) were between 11–40 years of age (Table 1).

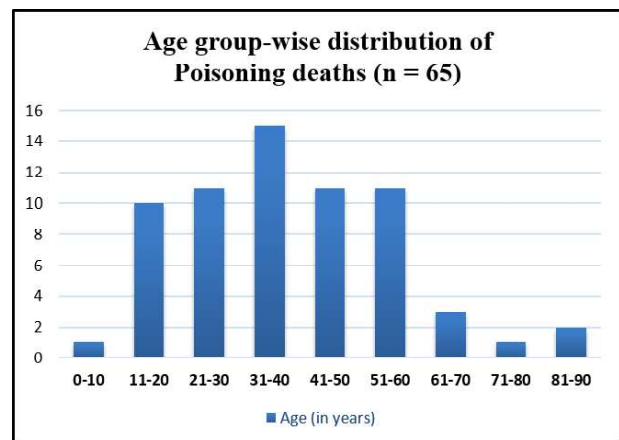


Fig. 1: Shows the age group-wise distribution of poisoning deaths.

Table 1: Shows the distribution of poisoning deaths according to age group and gender

Age Group (in years)	Male	Female
00-10	1	0
11-20	5	5
21-30	8	3
31-40	10	5
41-50	10	1
51-60	10	1
61-70	2	1
71-80	1	0
81-90	2	0
Total	49	16

Domicile pattern and marital status

Cases were relatively higher in rural (52.3%) areas than in urban (47.7%) areas. In both males and females, the majority of the fatal poisoning involved married individuals (Table 2).

Table 2: Shows the distribution of fatal poisoning according to marital status and gender.

Marital Status (n=65)	Male	Female	n (%)
Married	31	11	42 (64.6%)
Unmarried	15	5	20 (30.8%)
Divorced	1	0	01 (01.5%)
Not known	2	0	02 (03.1%)
Total	49	16	65 (100.0%)

Place and Manner of poisoning

In most of the cases, the location of exposure to poison was the victim’s home (53.8%), followed by secluded areas (36.9%) and workplace (6.2%), with one case (1.5%) each, happening in a public place and lodging, respectively. Among the cases, 44 (67.7%) were of intentional poisoning to commit suicide, and 18 cases (27.7%) were accidental. Homicidal poisoning constituted one case (1.5%), and manner remained undetermined in two (3.1%) of the cases. The majority of the fatal suicidal poisonings were in the age group of 31-40 years, the maximum number of fatal accidental poisonings occurred in the age group of 41-50 years, and only homicidal poisoning happened in the age group in 11-20 years (Table 3).

Table 3: Shows the distribution of manner of fatal poisoning according to age group.

Manner of Poisoning	Suicidal	Accidental	Homicidal	Undetermined
Age Group (in years) (n=65)				
00-10	0	1	0	0
11-20	8	0	1	1
21-30	8	3	0	0
31-40	11	4	0	0
41-50	4	7	0	0
51-60	8	2	0	1
61-70	3	0	0	0
71-80	1	0	0	0
81-90	1	1	0	0
Total	44	18	1	2

Season, diurnal variation, and year-wise

Most cases were noted during autumn (October to January), i.e., 29 (44.6%), followed by summer (February to May) and least during monsoon (June to September), which accounted for 20 (30.8%) and 16 (24.6%) cases respectively. A higher incidence of poisoning was observed during the daytime (07.00 AM to 06.59 PM), i.e., 47 (72.3%) cases, than during night (07.00 PM to 06.59 AM) time, which constituted 18 (27.7%) of cases. The maximum number of poisoning cases was recorded in January, while July had the least

(Fig. 2). The highest number, 15 (23.1%) deaths due to poisoning occurred during the year 2021, followed by 12 (18.5%) cases in 2019 and the least 4 (6.2%) cases in 2022 (Fig. 3).

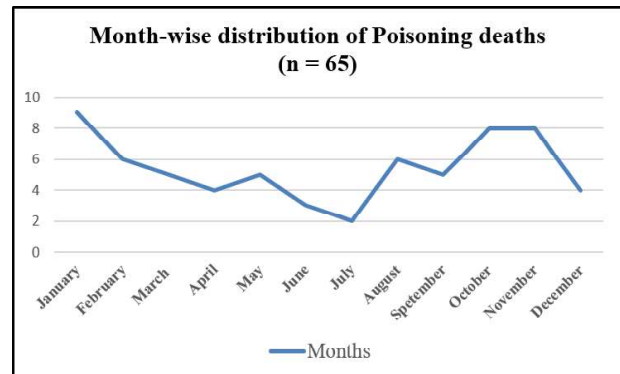


Fig. 2: Shows stack lines depicting the month-wise distribution of poisoning deaths.

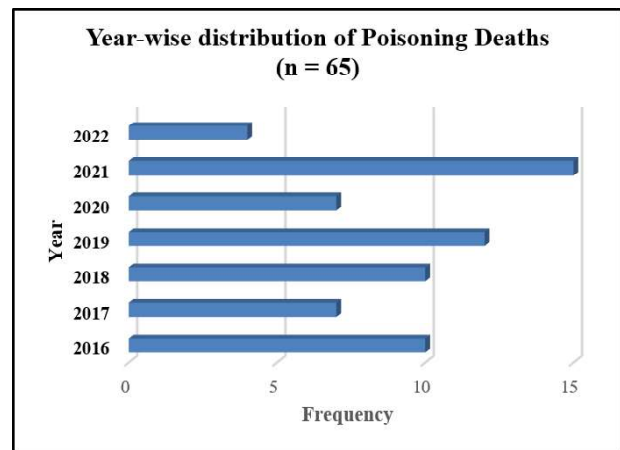


Fig. 3: Shows year-wise incidence of poisoning deaths.

Type of Poisoning

The most frequently observed cases were due to paraquat poisoning, with 21 (32.3%) cases. Accidental poisoning due to alcohol consumption resulted in 16 (24.6%). There were 15 (23.1%) cases of OPC poisoning. Combinations involved the use of drugs and alcohol in all cases, which resulted in 7 (10.8%) such deaths. There were two cases of Vasmol ingestion, which is used as hair dye and causes paraphenylenediamine toxicity. Asphyxiant poisoning due to carbon monoxide was recorded in one case, accidental in nature, in a three-year-old child (Table 4).

Exposure route and hospitalization

Almost all cases involved exposure to the poison through ingestion, except one case, which occurred due to accidental inhalation of carbon monoxide. Among the cases, the most frequent period of hospitalization before death was observed of more than 48 hours in 24 cases (36.9%), followed by 14 (21.5%) brought dead to hospital cases (Table 5). The majority of the cases of paraquat poisoning,

Table 4: Shows various types of poisoning in the study.

Poison (n=65)	n (%)
Paraquat	21 (32.3%)
Alcohol	16 (24.6%)
Organophosphorus Compounds	15 (23.1%)
Combinations	7 (10.8%)
Vasmol	2 (03.1%)
Drug	1 (01.5%)
Carbon Monoxide	1 (01.5%)
Unknown	2 (03.1%)

Table 5: Shows the distribution of survival periods for poisoning deaths.

Survival Period (n=65)	n (%)
Brought Dead to Hospital	14 (21.5%)
0-12 hours	13 (20.0%)
12-24 hours	7 (10.8%)
24-48 hours	7 (10.8%)
>48 hours	24 (36.9%)

OPC poisoning, and drug overdose survived for more than 48 hours before death. Most of the fatal poisoning related to alcohol were brought dead to the hospital (Table 6).

Poisoning cases according to occupation

Occupation-wise poisoning cases were more commonly found among males employed in a private job in 19 cases (29.2 %), government employees in 12 cases (18.5 %), homemakers in 11 cases (16.9%), and students in 9 cases (13.8%). Unemployment constituted 4 cases (6.2 %) (Fig. 4).

Stressors

The most common stressors of fatal poisoning documented were due to domestic issues, 16 (24.6%) cases, followed by alcoholism, 15 (23.1%) cases. Personal issues accounted for five (7.7%) cases, and accidental poisoning in four (6.2%)

cases. The individual was a known diagnosed case of psychiatric illness in three (4.6%) cases, exam failure and chronic comorbid conditions accounted for two (3.1 %) cases each, and unemployment and victim of sexual offence constituted as a stressor in one (1.5%) case each. Stressors remain undetermined in 16 cases, i.e., 24.6 % (Fig. 5).

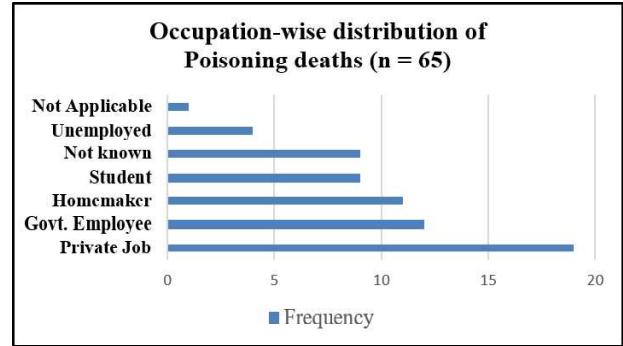


Fig. 4: Shows occupation-wise distribution of poisoning deaths.

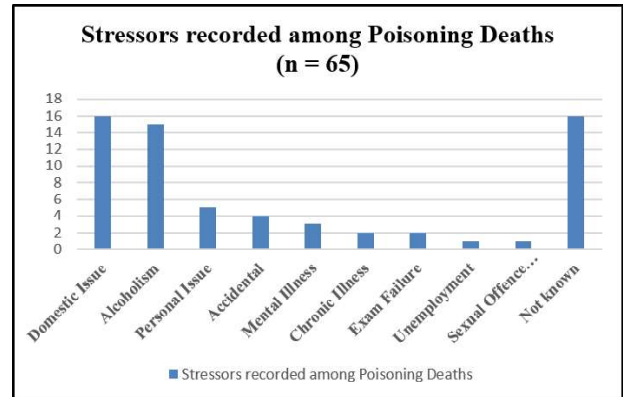


Fig. 5: Shows various stressors recorded among the poisoning deaths.

DISCUSSION

In this study, we observed the fatal poisoning cases autopsied at our tertiary care hospital in Port Blair, Andaman & Nicobar Islands in order to achieve the first-ever realistic

Table 6: Shows the distribution of various poisoning according to their survival period

Survival Period	Brought Dead to Hospital	0-12 hours	12-24 hours	24-48 hours	> 48 hours
Poison (n = 65)					
Paraquat	1	3	3	3	11
Alcohol	8	5	1	0	2
Organophosphorus Compounds	2	1	1	3	8
Combinations	2	4	0	0	1
Vasmol	0	0	0	0	2
Drug	0	0	0	1	0
Carbon Monoxide	1	0	0	0	0
Unknown	0	0	2	0	0
Total	14	13	7	7	24

approximation of the distributive patterns of fatal poisoning in the Andaman and Nicobar Islands. India is predominantly an agrarian nation, with a significant portion of its inhabitants residing in rural areas and relying on agriculture for their livelihoods. As a result, pesticides and herbicides are readily accessible in these areas, rendering the rural population more vulnerable to their effects. A similar domicile trend was observed in Western and Northern India studies.^{5,6} The poisoning cases constituted 4.4% of the cases of the medicolegal autopsies conducted during the study period. In contrast, most of the autopsy studies conducted in different regions of India constituted more than 8% prevalence of fatal poisoning among the autopsies conducted.⁵⁻⁹ This observation could be due to a lesser extent of agricultural work in the Andaman and Nicobar Islands and less access to prevalent agricultural poisons, the main cause of fatal poisoning throughout India.

This study demonstrates that males are more susceptible than females, consistent with research conducted in other regions of India.⁵⁻¹⁰ The elevated prevalence could be attributed to males' greater susceptibility to stress, strain, and occupational hazards. It could be linked to more male involvement in agricultural work and convenient accessibility to poisonous substances in their work.¹¹ The proportion of individuals whose autopsy results were influenced by poisoning was greater among Hindus. This observation is similar to the findings of other studies on fatal poisoning in India.^{5,10,11} This may result from a smaller representation in the population of other communities.

A higher number of fatal poisonings were found primarily among married males also the higher death rate among married females could not be disregarded, all pointing toward domestic issues. This indicates an increase in the tension level of individuals, especially men, after getting married due to the responsibility of supporting the family. The age group of 31 to 40 years exhibited the highest frequency of fatal poisonings in our study. This is in contrast to studies in other regions of India, where the age group of 21-30 years was more involved in cases of fatal poisoning.^{5-10,12} This may be attributed to higher education, professional careers, social obligations, marriage, children, relationships, and economic responsibilities. This age cohort contradicts the results of other studies.^{12,13}

The minimum reporting of homicidal poisoning indicates that poison is presently regarded as a less desirable method of committing murder. This finding is consistent with previous studies conducted in regions of India.^{5,7,9,10,12,14} Most of the cases were of deaths due to intentional intake of poisons. This is similar to studies done in other regions of India.^{5,7,9,10,12,14} The majority of victims prefer to commit suicide in their residences, which is consistent with the study conducted by Parekh et al., in Western India.⁵

The highest number of cases in the present study was documented in January, followed by October and November

(12.3%). This result is in contrast to other studies, Parekh et al., found July, whereas Singh et al., found May, and Bhagora et al. recorded October as the month where most of the fatal poisonings were reported.^{5,6,12} Conversely, previous research in other regions of India focused on the monsoon season owing to the destruction of agriculture yields.¹⁴ Our study revealed that the highest number of cases occurred in autumn (44.6%). This may be ascribed to the fact that most poisoning victims were employed in private jobs, and cultivation does not constitute the primary source of income in the islands due to the preponderance of imported dietary materials.

Paraquat poisoning accounted for most of the poisoning-related fatalities in the islands. This finding contrasts with some studies that found aluminum phosphide the most common poison.^{5,6,15} No aluminum phosphide poisoning was recorded in the present study. Other studies found organophosphorous compound poisoning to be the most common.^{7-14,16} The second emerging cause of poisoning in the present study is inadvertent alcohol consumption by males, which is facilitated by easy accessibility, adulterants, low prices, and unrestricted sales. Vasmol poisoning, which has occurred in two cases in the islands, is a novel noxious substance found in many households as hair dye, causes parafenylenediamine toxicity, and is an emerging cause of poisoning in tropical states. The studies by Poluru et al. and Kidiyoor et al., have also recorded Vasmol poisoning in their study of fatal poisoning.^{9,16} In almost all cases in the present study, ingestion remained the most common route of exposure to poisons except one which had accidental inhalation of carbon monoxide due to a fire at a hotel. This finding is consistent with other studies on fatal poisoning conducted in India, which also had ingestion of poison as the most common route of exposure.⁵⁻¹⁶

Most of the poisoning incidents in the present study happened during the daytime (07.00 AM to 06.59 PM). The studies by Parekh et al. and Maharani et al., showed similar results.^{5,10} Most of the cases of fatal poisoning in the present study survived for more than 48 hours after exposure. The study by Poluru et al. showed a 1-3 days survival period, whereas a study by Kidiyoor had a survival period of less than 12 hours, the most common hospitalization period before death among treated cases.^{9,16} Compared to other poisons, the extended length of hospitalization in cases employing weedicides and insecticides suggests the severity of these substances despite proper treatment modalities. Our study documented instances of unintentional alcohol poisoning that resulted in a faster mortality rate than cases of intentional self-harm.

The present research highlights domestic issues, which included monetary problems as the most prevalent sources of stress among married individuals (24.6%), with alcoholism trailing in second place (23.1%) among private and government employees. Mental illness was also a factor

in deliberate poisoning in 4.6% of cases in the present study. Exam failure and victims of sexual offenses were diagnosed as stressors among students. Similar stressors related to poisoning cases have been reported by other studies.^{5,7-10,12}

CONCLUSION

This research represented a novel strategy for elucidating the pattern of catastrophic poisoning cases across the islands. This study could be extremely useful for identifying significant factors contributing to poisoning cases. Married males residing in rural areas who were employed in private jobs were found to be more susceptible. The prevalence of women was observed in matters of domestic affairs. The highest number of fatalities was attributed to paraquat poisoning. To help combat this, developing a poison information center that includes a national database of poisons and their corresponding treatment guidelines, training healthcare providers in primary healthcare facilities (PHCs) and community health centers (CHCs), and ensuring easy availability of antidotes in remote islands can prove beneficial. In order to address the alarming rates of suicides in the Andaman and Nicobar Islands, it is crucial to raise awareness and provide easy access to counseling centers.

Additionally, stricter enforcement of pesticide regulations and the establishment of a toll-free helpline number can play a significant role in reducing these tragic incidents. The study's findings are limited in scope as it was only conducted in a single center. Further evaluation of the spatial distribution of poisoning cases across the different islands is necessary to generate a comprehensive Andaman and Nicobar Islands database.

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Conflict of interest: The authors have no conflict of interest to declare.

ETHICAL APPROVAL

The ethical approval for the study was obtained from the Institutional Ethics Committee, Andaman & Nicobar Islands Institute of Medical Sciences (ANIIMS), Port Blair, Andaman & Nicobar Islands (ANIIMS/IEC/2022-23/41).

AUTHORS CONTRIBUTIONS

All authors have contributed equally to the study and approved the final draft of the manuscript.

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