Original Research Article

An autopsy study of cases of Death Due to Poisoning in the Department of FMT, RIMS, Adilabad

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Abstract

Introduction: Pesticide poisoning is one of the major problems across the world and more so in developing countries like India where there is the ease of availability of poisons. Therefore,in all cases of unnatural deaths when the cause is elusive, poisoning remains an important aspect for investigating officers and forensic experts while conducting post-mortem examinations. **Methods:** Detailed information of the deceased was collected from the concerned police officials and relatives of the case. Post-mortem findings were analyzed with chemical analysis reports. If the cases were treated before death information was obtained from the hospital records.**Results:** The chemical analysis reports of the study revealed n=120(80%) cases of poisoning with agricultural poisons. Out of n=120 cases in which agricultural poisons were used n=100 cases were poisoning with organophosphorus compounds. Carbamate and phosphide poisoning were seen in n=8 each and pyrethroid and paraquat poisoning were found in n=2 cases each. Cyanide poisoning was found in 1.33% of cases. Corrosive poisoning occurred in n=18 cases out of which phenol was used in 6.67% cases and formaldehyde in 5.33% cases. N=10 cases were due to neurotoxic poisons.**Conclusion**: Pesticides are frequently used in agriculture and ease of access to these products has led to the use of them for suicidal purposes. Several studies have described the gravity of acute pesticide poisoning however, only a few have described the findings during autopsy and histopathological findings. Efforts must be made to find more effective alternative pesticides which may be relatively harmless to humans.

Keywords: Poisoning, Pesticides, Organophosphates, Autopsy Findings

Introduction

The word poison comes from the Latin word 'potion' which means to drink for health. The definition of poison has changed to its present form which is any substance which when administered, inhaled, or ingested is capable of acting deleteriously on the human body. [1]There is no real boundary between medicine and poison because medicine in a toxic dose may be poison and poison in a small dose maybe medicine. Poisoning is the most common cause of unnatural death. The knowledge of poisoning was prevalent in India from ancient times. It has been estimated that some form of poison is directly or indirectly responsible for more than 1 million illnesses worldwide and the problem is getting worse from time to time as new drugs and chemicals are developed in vast numbers. [2] Pesticide poisoning is a major problem in countries like India.Organophosphorus compounds are the common cause of self-poisoning deaths reported in south and central India. Availability of a large number of pesticides for use in agriculture and introduction of a variety of newer agents for treatment and exposure to hazardous chemical products due to rapid industrialization coupled with an increase in alcohol consumption has to lead to a wide spectrum of toxic products to which people are exposed in this era as compared to earlier days. In developing countries,the type of poison andthe associated morbidity and mortality differs based on the pace and it tends to change over a period. The Ease of availability and low cost of hazardous chemicals is the important reason for use of such poisons in suicidal, accidental, and homicidal poisoning. Previously the cases of poisoning were mostly accidental but presently poisons are the commonest mode of committing suicide. In India, there is no check on their sale, and anybody canpurchase it over the counter. Due to this, there is an increase in the number of poisoning cases across the country in past few years. The commonly used poisons these days are organo-phosphorus compounds and aluminum phosphide.According to the World Health Organization (WHO), 99 percent of the fatal poisoningcases occur in developing countries, predominantly among the farmers due to various kinds ofpoisoning, including poisonous toxins from natural products during handling. [3]Therefore, early diagnosis, treatment, and prevention are crucial in reducing the burden of poisoning-related injury in any country.It is very difficult to draw a report to say which kind of poisoning is more frequent, hasthe nature of poisoning varies from one region to another depending upon the poison availabilityand the knowledge and local population regarding the properties of poisons. So this study hasbeen aimed to determine the various parameters of poisoning such as mode of poisoning, type ofpoison, chemical analysis report concerned with the type of poisoning, vulnerable age group and to find out the most commontype of poison used in RIMS Adilabad.

Material and Methods

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This cross-sectional study was done in the Department of Forensic Medicine and Toxicology, Rajiv Gandhi Institute of Medical Sciences [RIMS], Adilabad. Ethical clearance for the study was obtained from Institutional Ethical Committee. A total of n=150 cases brought to the department for medicolegal autopsy and with the history of poisoning and cases which were diagnosed as poisoning after post-mortem examination were included in the study based on the inclusion and exclusion criteria.

Inclusion Criteria

1. An autopsy on all cases of poisoning deaths conducted at the mortuary, RIMS Adilabad.
2. Cases diagnosed as poisoning after complete Post-Mortem examination.

Exclusion Criteria

1. The autopsy on unidentified bodies.
2. The autopsy on decomposed bodies.
3. The autopsy on the alleged history of poisoning deaths with no poisons detected in chemical analysis.

The Detailed information of the deceased was collected from the concerned police officials and relatives of the case. Post-mortem findings were analyzed with chemical analysis reports. If the cases were treated before death information was obtained from the hospital records. In some cases where allegations were existing the information was supplemented from the scene of the crime or the photographs of the scene of the crime. An autopsy was performed using Lettulle's evisceration technique. The examination and weight of organs were done before dissection. Gross examination of the organs was performed, and each organ was dissected as per the standard autopsy technique. In all the cases viscera were subjected for chemical analysis to FSL Hyderabad. The routine viscera and body fluids were sent to FSL for chemical analysis. These included the entire stomach and its contents. The upper part of the small intestine. Liver more than 500gms. Half of each kidney, blood 10 -30 ml, urine 30 – 50 ml if present. All the available data was uploaded on an MS Excel spreadsheet and analyzed using SPSS version 19 for descriptive statistics.

Results

A total of n=150 cases of poisoning were included in the study out of which n=100(66.67%) were males and n=50 (33.33%) were female cases. The most common age involved with poisoning was 41-60 years with n=100(66.67%) cases. In males, the maximum number of poisoning 35% were between the age 51 – 60 years and in females, the maximum number of cases was 40% in the age group 41- 50 years details given in table 1.

Table 1: Distribution of poisoning cases according to age group

Age in years	Male	female	Number of cases	Percentage
21 – 30	4	1	5	03.33
31 – 40	10	5	15	10.00
41 – 50	30	20	50	33.33
51 – 60	35	15	50	33.33
> 60	21	9	30	20.00
Total	100	50	150	100

According to Kuppuswamy's classification of Socio-Economic status, it is observedthe maximum number of poisoning cases were noticed among lower-middle-class III n=80 cases followed by upper lower class IV and lower-class V. No cases in the upper class I and upper-middle-class II categories. Because predominant cases are from rural setup n=145 (96.67%) more cases of poisoning are seen among the lower and socioeconomically weaker sections (Table 2).

Table 2: Distribution of poisoning cases according to socioeconomic status

Socio Economic status	Number of cases	Percentage
Upper Class – I	0	0
Upper Middle Class – II	0	0
Lower Middle Class - III	80	53.33
Upper Lower Class - IV	40	26.67
Lower – V	30	20.00
Total	150	100.00

In this study out of n=150 cases, n=135(90%) were married and n=15(10%) were unmarried cases. Out of the n=15 unmarried n=10 cases were females and n=5 cases were males. In the study, we found 33.33% of cases reported during October to November (post-monsoon season) followed by December to February 26.67% (winter season) and 20% each in March to June and July to September seasons. Out of n=150 cases, n=148 (98.67%) were suicidal poisonings and n=2(3.33%) cases were accidental poisoning. N=120(80%) cases were initially admitted to the hospital for treatment and death occurred in the hospital and n=30(20%) were cases that were brought dead. Out of the n=120 cases treated in the hospital, n=5(3.33%) were brought within one hour of poisoning to the hospital. N=15(10%) were brought within 1 – 6 hours of poisoning. N=75(50%) were brought between 6 – 12 hours of poisoning and n=25(16.67%) cases were brought between 12-24 hours of poisoning. The chemical analysis reports of poison in the cases of the study revealed n=120(80%) cases of poisoning with agricultural poisons. Out of n=120 cases in which agricultural poisons were used n=100 cases were poisoning with organophosphorus compounds. Carbamate and phosphide poisoning were seen in n=8 each and pyrethroid and paraquat poisoning were found in n=2 cases each. Cyanide poisoning was found in 1.33% of cases. Corrosive poisoning occurred in n=18 cases out of which phenol was used in 6.67% cases and formaldehyde in 5.33% cases. N=10 cases were due to neurotoxic poisons given in table 3.

Table 3: Distribution of poisoning cases according to the type of poison

Poison	Number of cases	Percentage
Agricultural poisons	120	80.00
Asphyxiants Carbon Monoxide	0	0.00
Cardiotoxic poison Cyanide Metoprolol	 2 0	 1.33 0.00
Corrosives		

Formaldehyde	08	5.33
Phenol	10	6.67
Neurotoxic poisons		
Phenobarbitone	2	1.33
Ethyl alcohol	8	5.33

The predominant histopathological findings in the lungs of the cases with organophosphate poisoning revealed congestion in n=50 cases followed by pulmonary edema in n=40 cases and pulmonary hemorrhage in n=10 cases. The other compound which predominantly caused congestion of the lungs was Ethyl alcohol followed by phenol. The compounds significantly causing pulmonary edema were carbamate, formaldehyde, and phenol. Cyanide poisoning showed pulmonary hemorrhage in both cases the details given in table 4. The commonest histopathological changes observed in the liver in cases of OP poisoning was congestion followed by fatty change the other poisons and observations have been depicted in table 5.

Table 4: Distribution of histopathological changes in lungs

Poison	Frequency	Congestion (No. of cases)	Pulmonary edema (No. of cases)	Pulmonary hemorrhage (No.of cases)
Organophosphates	100	50	40	10
Phosphide	8	2	4	2
Pyrethroid	2	0	2	0
Carbamate	8	2	6	0
Paraquat	2	2	0	0
CO	0	0	0	0
Cyanide	2	0	0	2
Metoprolol	0	0	0	0
Formaldehyde	8	2	6	0
Phenol	10	4	6	0
Phenobarbitone	2	2	0	0
Ethyl alcohol	8	6	2	0

Table 5: Distribution of histopathological changes in liver

	Frequency	Congestion	FC	SD	PVN	CVN	CLN	HN
OP	100	50	30	5	5	5	5	0
Phosphide	8	2	2	0	0	0	0	0
Pyrethroid	2	0	0	0	0	0	0	0
Carbamate	8	2	2	0	0	0	0	0
Paraquat	2	2	2	0	0	0	0	0
CO	0	0	0	0	0	0	0	0
Cyanide	2	0	0	0	0	0	0	0
Metoprolol	0	0	0	0	0	0	0	0
Formaldehyde	8	2	2	0	0	0	0	0
Phenol	10	4	4	0	0	0	0	0
Phenobarbitone	2	2	2	0	0	0	0	0
Ethyl alcohol	8	6	6	0	0	0	0	0

FC – fatty change, SD – sinusoidal dilatation, PVN – perivenular necrosis, CVN –centrivenular necrosis, CLN – centrilobular necrosis, HN – hemorrhagic necrosis

Discussion

South India is predominantly agriculturally based and in this study, most of the cases were from rural and tribal areas of Adilabad. The ease of availability of poisons and frequent failure of crops and economic hardships could be the root cause of a higher frequency of death due to poisoning. In this study n=100(66.67%) were males and n=50 (33.33%) were female cases the male to female ratio was 2:1. A similar pattern of male preponderance was found from other studies probably due to the high dependence of family on male as breadwinners. [4 - 7] Some studies have reported a higher male-to-female ratio of 3:1 [8-9] maximum numbers of cases in the study were from the age group 41 – 60 years which could be due to economic reasons. Awasthi PM et al; in a similar study in Kanpur found 32.2% of cases from 21 – 30 years could be because they are more aggressive, intolerant, emotional, and irrational. [10]In this studyn=135(90%) were married and n=15(10%) were unmarried cases. Most of the deaths (33.3%) were reported during the months of October to November. Other studies have shown most of the cases of poisoning in the summer months of March to June. [10]one of the reasons for higher deaths during post-monsoon seasons could be inadequate harvest which leads to the higher economic burden of already debt-ridden farmers. The maximum number of poisoning were found in lower-middle-class IV of Kuppuswamy's classification most of the victims were from rural areas. These findings were similar to those reported by N Varma et al; [11] AK Kapoor et al; [12].According to the manner of death n=148 (98.67%) were suicidal poisonings and n=2(3.33%) cases were accidental poisoning the results are consistent with other studies by Sharma BR et al; [13] Karamjit Singh et al; [14] Sanjeev Chaudhry et al; [15]Among the poisons detected by FSL n=120 cases were poisoning with agricultural related poisons which included n=100 organophosphates and other poisons (table 3 & 4). V Palimar et al; [16] found out of n=372 cases n=287 were due to insecticides with the predominance of organophosphates with most of them of rural background agreeing with the observations of the current study. In this study on external examination of the deceased, the presence of characteristic odor was found in n=125 cases, frothing from nose or mouth was seen in n=115 cases. The predominant histopathological findings in the lungs of the cases with organophosphate poisoning revealed congestion in n=50 cases followed by pulmonary edema in n=40 cases and pulmonary hemorrhage in n=10 cases. N=40 cases were found with abundant mucus in bronchi which could be due to

hyperactivity of the parasympathetic nervous system due to poisoning.[17]Liver congestion was revealed in n=70 cases of poisoning followed by fatty changes in n=20 cases. N=5 cases each of sinusoidal dilatation (SD), Perivenular necrosis (PVN), centrivenular necrosis (CVN), Centrilobular necrosis of the liver (CLN) were found.

Conclusion

Pesticides are frequently used in agriculture and ease of access to these products has led to the use of them for suicidal purposes. Several studies have described the gravity of acute pesticide poisoning however, only a few have described the findings during autopsy and histopathological findings. Efforts must be made to find more effective alternative pesticides which may be relatively harmless to humans. Public education regarding the proper use of pesticides presence of counselingcenters for economically distressed farmers and the early identification and treatment of poisoning cases will reduce mortality.

References

1. Reddy KSN, OP Murthy. The Essentials of Forensic Medicine and Toxicology 27th ed. Jaypee Medical Publishers. India.2008; 27.
2. Esayas Tadesse G/Mariam, Belayneh Kefale Gelaw. Global epidemiology of acute poisoning with an emphasis to Ethiopia: a systematic review. Int J Pharm Sci & Scient Res 2016; 2(4):161 -171.
3. C Srinivas Rao. V Venketashwarlu, T Surender, M Eddleston NA Buckley. Pesticide poisoning in South India-Opportunities for prevention and improved medical management. Trop Med Int Health 2005; 10(6):581-588.
4. Sharma R, Neelanjana RN, Rawat N, et al. Mortality and morbidity associated with acute poisoning cases in North-East India- A retrospective study. J Family Med Prim Care. 2019;8 (6):2068–72.
5. Das RK. Epidemiology of insecticide poisoning at AIIMS emergency services and role of its detection by gas-liquid chromatography in diagnosis. Med Legal Update. 2007;7:49–60.
6. Dhattarwal SK, Singh H. Profile of deaths due to poisoning in Rohtak, Haryana. J For Med Tox 2001; 18:28-9.
7. Nigam M, Jain AK, Dubey BP, Sharma VK. Trends of organophosphorus poisoning in Bhopal region - An autopsy-based study. Journal of Indian Academy of Forensic Medicine. 2004;26(2):62-5.
8. Kanchan T, Menezes RG. Suicidal poisoning in Southern India: gender differences. J Forensic Leg Med. 2008; 15(1):7-14.
9. Ahmad M, FN Rahman FM, Islam MM, Majumder MRU. Death due to Poisoning -A Medicolegal Study at Dhaka Medical College, Dhaka. Faridpur Med. Coll. J. 2014; 9(2):76-79.
10. Awasthi PM, Dev R, Verma S, Pathak A, Bajpai A, Bharti A, Kumar. A. Medico-legal Evaluation of Death due to Poisoning. Indian Journal of Forensic Medicine & Toxicology, January-March 2019;13(1):52 – 56.
11. Navin Varma and SD Kalele. Study of Profile of Deaths due to Poisoning in Bhavnagar Region. JIAFM; 2011; 33(4): 313-318.
12. AK Kapoor, An epidemiological study of Aluminium Phosphide poisoning at Allahabad. IIJFMT; 2006: 4(1):1-11.
13. Sharma BR, Harish Dasari, Sharma V, Vij K. The epidemiology of poisoning: An Indian View point. Journal of Forensic Medicine and Toxicology. 2002; 19(2): 5-11.
14. Karamjit Singh, Oberoi SS, Bhullar DS. Poisoning Trends in the Malwa Region of Punjab. Journal of Punjab Academy of Forensic Medicine and Toxicology. 2003; 3:26-29.
15. Sanjeev Chaudhary, S.G. Momin**,** Dipak H. Vora et al. An Epidemiological Study of Fatal Aluminium Phosphide Poisoning at Rajkot, IOSR Journal of pharmacy.2013; 3(1): 17-23.
16. Palimar V, Rastogi P. Mortality due to insecticide poisoning: A retrospective postmortem study. Journal of South India Medicolegal Association.2011:3(2): 50-52.
17. Mostafalou S, Abdollahi M. Pesticides: an update of human exposure andtoxicity. Arch Toxicol. 2017; 91: 549–99.

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