Original Research

Socio-demographic Profile of Deaths due to Poisoning at a Tertiary Care Hospital in Bangalore

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Abstract

Background: Deaths due to poisons form inexorable part of all unnatural deaths in the current era of social, cultural and personal dilemma existing among mankind. Stress, poverty, financial insecurities, personal conflicts, unemployment, ill health, psychological disturbances, difficulties in psycho-social adaptability and loneliness contribute significantly to the ever-increasing mortality in poison deaths.

Methods and results: A 20-month prospective descriptive study was conducted at the Department of Forensic Medicine and Toxicology, Victoria Hospital, Bangalore Medical College and Research Institute on cases of death due to poisoning. Out of 110 cases, maximum number of cases were male (63.63%), in the age group of 21-30 years (33.63%). 92.72% belonged to Hindu religion and 55.45% belonged to the upper lower class. 54.54% belonged to urban areas and 60% were married victims. Maximum numbers of cases (38.18%) were recorded in winter, commonly between 5pm – 10 pm (39.09%) and 84.54% occurred at the place of residence. 84.54% of cases were suicidal in nature with psychological causes being the most common motive (30.90%). 81.81% of cases received treatment and 34.53% succumbed to death within 1-7 days of consumption of poison. Organophosphorus group of insecticide (50%) was the most common poison encountered, followed by Phosphide ions (30%).

Conclusion: Poisoning is a major epidemic of non-communicable disease in the present century. Suicidal and accidental poisoning are significant contributors to morbidity and mortality throughout the world.

Keywords: *Demographic profile, Phosphide, Poisoning, Organophosphorus*

Introduction

According to the World Health Organization, a poison is a substance (solid, liquid or gaseous), which if introduced to the living body or brought into contact with any part thereof, will produce ill health or death, by its constitutional or local effect or both[1]. As per WHO, about 3 million cases of poisoning with 2,20,000 death occur annually worldwide, of which 90% of the cases occur in developing countries particularly among agricultural workers[2]. According to NCRB (National crime records bureau) statistics of 2015, 37232 persons committed suicide by poisoning in India, of which 23930 persons committed suicide by consuming insecticides and 13302 persons consumed other poisons. 39.1% of deaths (26173) were attributed to accidental poisoning[3]. Poisoning suggests an acute event demanding immediate care and attention.

History indicates that the use of poisons has been known since time immemorial. In the antiquity, the main way to poison an enemy was by adding plant or animal toxins into food and drinks. In the Middle Ages, the progress within this area moved forward. Inorganic toxic compounds prevailed. Moreover, such substances were applied more sophisticatedly, i.e., by poisoning of

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the gloves, page corners, wigs, etc. Additionally, there was one more intermingling feature—usage of poisons for unfair purposes had not been usually proven. Thus, criminals had a big chance to escape the punishment. In the Middle Ages, poisons were freely sold in pharmacies. The first attempt to stop free trade with poisons was made in Italy. In modern day India, there are a number of legislatures in place, such as Drugs and Cosmetics Act of 1940, Narcotics Drugs and Psychotropic Substances Act of 1985 and its 2014 amendment that prevent the illegal manufacture, possession and distribution of poisons and other toxic substances.

Poisoning is a major epidemic of non-communicable disease in the present century. Among the unnatural deaths, deaths due to poisoning come next only to road traffic accident deaths. The choice of poisoning agents depends on availability, cost, harmful effects of poison and regional consideration[4]. Pesticides which were invented to protect crops from rodents, insects and humans from starvation have themselves become an important contributor to unnatural deaths[5]. This study was conducted to know the various influencing factors associated with death due to poisoning like age, sex, marital status, occupation, availability of poison and socio-economic status. Knowledge regarding the type of poison chosen might help in imposing restrictions on the sale of those poisons and hence help in preventing deaths due to poisoning.

Material and Methods

All cases of deaths due to poisoning brought to Department of Forensic Medicine and Toxicology, Victoria Hospital, Bangalore Medical College and Research Institute for autopsies between October 2016 to May 2018 were selected on a purposive sampling basis.

Following inclusion criteria were taken into consideration:

1. Autopsy on all cases of deaths due to poisoning conducted at Department of Forensic Medicine and Toxicology, Bangalore Medical College and Research Institute during the study period.

2. Cases confirmed as poisoning by chemical analysis report from Forensic Science Laboratory and based on the hospital case sheet records.

Following exclusion criteria were taken into consideration:

1. Autopsy on unidentified bodies.

2. Autopsy on decomposed bodies.

3. Cases of poisoning where the Forensic Science Laboratory report and/or hospital case sheet records are unavailable.

The details of family history, previous medical history and any treatment records, when available, were obtained from concerned police. Autopsy was performed using the Letulle's evisceration technique, examining all organs. Viscera and blood were sent for chemical analysis to Forensic Science Laboratory. The data obtained from this study was then analysed statistically using Statistical Package for the Social Sciences (SPSS 20) and the data was presented in the form of appropriate tables, computing descriptive statistics such as percentages.

Results and Discussion

During the study period, a total of 110 cases of poisoning were studied and the corresponding chemical analysis reports from Forensic Science were obtained. In this study, the maximum number of cases i.e. 70 were male (63.63%) and the rest i.e. 40 were female (36.36%). This can be attributed to the fact that males form the majority of the population and being the sole breadwinner in most families, have to shoulder many responsibilities making them more vulnerable. Whereas, women who are commonly subjected to post-marital problems such as cruelty by husband/in-laws tend to fall prey to suicides by poisoning. Similar findings were observed in the study conducted by Kanchan T, Menezes RG[6]. The observation went against the study conducted by Kar SM, Sidartha Timsinha, Prashant Agrawal[7].

In this study, the maximum number of cases i.e. 37 were in the age group of 21-30 years (33.63%), followed by 19 cases in the age group of 31-40 years (17.27%). The least number of cases were observed in the 71-80 years (0.90%) and 81-90 years (0.90%) age group (Table 1). Ambition, adventurous mind, aggressive personality, opportunity hunting, academic pressure and challenges,

allure of opposite sex affect the younger age group. Study conducted by Singh B, Unnikrishnan B[8] noted similar findings, whereas contrasting findings were noted in the study conducted by Lee WJ, Cha ES, Park ES et. Al[9].

In this study, maximum number of cases i.e. 102 belonged to Hindu religion (92.72%), followed by Muslims (5.45%) and Christians (1.81%). This can be explained by the fact that Hindus form the majority of the Indian population. This is supported by the study conducted by Patel NS, Srivastava AK, Amit Kumar et.al.[10], and the study conducted by Gupta BD, Vaghela PC[11].

According to modified Kuppuswamy socioeconomic status classification, in this study, it was found the maximum number victims belonged to the upper lower class (55.45%) and the least number of victims (1.81%) in the upper class (Table 2). Lack of education, inability to achieve desired educational qualification, financial inadequacy to pursue education, work pressure, job dissatisfaction, failure to achieve targets, strain in employer-employee relationship, excessive debt, low income, over expenditure are the common issues encountered among the lower strata of the society. Patel DJ, Tekade PR[12] have observed similar findings in their respective studies. Whereas, opposing findings were noted in the study conducted by Bharath K Guntheti, Uday Pal Singh[13].

The distribution of domicile pattern of the victims showed that 60 were from urban areas (54.54%) and 50 were from rural areas (45.45%). This can be attributed to the fact that this study was conducted in the metropolitan city of Bengaluru. Problems of urbanization include over population, intense competition, adaptability issues, unemployment, stress, high cost of living, financial mishaps, desire to make a quick buck and living beyond one's means. Contrasting findings were observed in the study by Gargi J, Tejpal H R, Ashok Chanana et. al.[14], and the study conducted by Sharma BR, Nidhi Relhan, Neha Gupta et. Al[15].

It was noted that the maximum number of cases were seen among married victims i.e. 66 cases amounting to 60%, followed by unmarried victims i.e. 44 cases amounting to 40%. Early marriage, lack of compatibility, high expectations from the spouse, adjustment problems with in-laws and the new environment especially among women, lack of parental support - more so in love marriages, dowry demand, infidelity, domestic violence, cross-cultural clashes are the common issues that plague the institution of marriage. Similar findings were noted in the study by Dipayan Deb Barman, Vijaya Kumar Nair, Karnaboopathy GR[16]. Opposing findings were noted in the study by Patel NS, Srivastava AK, Amit Kumar et.al[10].

Maximum numbers of cases i.e. 42 were recorded in winter (38.18%), followed by 26 victims each in summer (23.63%) and monsoon (23.63%). Even though it is very difficult to establish a genuine correlation for this, factors such gloomy weather, predisposition to respiratory illnesses, lack of job opportunities could play a significant role. In the study by Tüfekçi I B, Curgunlu A, Sirin F[17] same observations were made. This finding is deviant from the observations in the study conducted by Kar SM, Sidartha Timsinha, Prashant Agrawal[7].

It was observed that the most common time of incident was between 5pm – 10 pm (43 cases – 39.09%), followed by 10am – 5pm (35 cases - 31.81%). The least number of cases were observed between 6am – 10am (13.63%). It is not possible to arrive at a precise conclusion for increased number of deaths for the above said duration. However, leisure time after work hours resulting in family interaction and conflicts, recapping of distressing events, alcohol consumption etc. can lead to the fatal event. Similar finding in males was noted in the study by Kanchan T, Menezes RG[6]. Contrasting findings were noted in the study by Bharath K Guntheti, Uday Pal Singh[13].

The place of residence was the most common place of occurrence of incident as seen in 93 cases i.e. 84.54%. Two cases of accidental cyanide poisoning in children were noted at their father's workplace which was a goldsmith's shop (Table 3). Privacy of one's own home, closed doors and an unsuspicious environment made the victim's residence the place of choice for such an extreme step. Dipayan Deb Barman, Vijaya Kumar Nair, Karnaboopathy GR[16] noted similar findings in their respective studies.

The present study shows that 84.54% of cases i.e. 93 were suicidal in nature. Accidental poisoning constituted 12.72% of cases and 2.72% of cases were homicidal in nature. Poisoning is one of easiest methods

of committing suicide. Easy availability, vast spectrum of poisons, cost-effectiveness and surety of death make poisoning an appealing means of committing suicide. In their study, Lee WJ, Cha ES, Park ES et. Al[9] have noted similar findings. The observations in the study by Lan Zhou, Liang Liu, Lin Chang et. al.[18] was deviant from these findings.

The most common motive for death was found to be psychological reasons in 34 victims i.e. 30.90% of cases, followed by domestic reasons in 29 victims i.e. 26.36% of cases (Table 4). In the current scenario of rapid and irrational urbanization where ever-changing pattern of life is affecting the individual at all levels – personal, educational, occupational, marital, social, cultural and financial; conflict within oneself and with one's environment is inevitable. The burden of imbalance of one or more of these factors is borne by the psyche of the victim, leading to the ultimate decision of suicide. Depression, psychosis, bipolar disorder, schizophrenia, drug and alcohol dependence are some of the psychiatric disorders affecting such victims. Domestic reasons include premarital factors such as romantic misendeavours, loss of dear ones, coercion/blackmailing by a trusted partner, conflict with parents and partner rejection; and post-marital factors include lack of compatibility, infidelity, adjustment problems with in-laws, dowry demand, domestic violence etc. Financial reasons constitute staggering expense of living, desire to make a quick buck and living beyond one's means, financial mishaps, excessive debt, low income etc. Such findings were also observed by Patel NS, Srivastava AK, Amit Kumar et.al.[10], in their study.

It was observed that maximum number of cases i.e. 99 were booked under Section 174 CrPC (90%) This can be explained by the fact that majority of the medicolegal autopsies fall under Section 174 CrPC which deals with unnatural deaths. Two cases (1.81%) were registered under Section 174 'C' CrPC which deals with suspicious deaths. Three cases (2.72%) were booked under Section 176 CrPC which deals with Magistrate inquest, conducted when death occurs in police custody. Three cases (2.72%) were booked under Section 306 IPC which deals with abetment of suicide. These were cases of married women where their husband / in-laws were held responsible for the abetment of the victim's suicide. Two cases (1.81%) were booked under Section 498(A) IPC which deals with husband or relatives of husband subjecting a woman to cruelty. One case (0.90%) was registered under Section 304(B) IPC which refers to dowry death. There were two cases (1.81%) booked under Section 302 IPC which is the punishment for murder. The circumstance of this case was that the mother, who was a victim of domestic abuse, decided to end the lives of her children in a bid to free them from the abuse.

Out of the total 110 cases that were studied, 90 victims were admitted in a hospital and received treatment (81.81%). The rest did not receive any treatment. This study was conducted at Victoria Hospital which is a tertiary care hospital catering to a significant local population and also to the surrounding towns, cities and states; a large majority of patients seek treatment here resulting in good numbers of treated patients. Timely action by the relatives, speedy transport and swift intervention by the doctors also contributed towards majority of victims being treated. High dose of consumption, rapid action of poison and act of poisoning going unnoticed by the relatives could be factors which resulted in non-treatment.

The most common poison encountered in this study was Organophosphorus group of insecticide (55 cases - 50%), followed by Phosphide ions in 33 cases - 30% (Tables 5 and 6). The findings are in accordance with the findings observed in the study by Shetty AK, Jirli PS, Bastia BK[19]. Opposing findings were noted in the study by Shadnia S, Esmaily H, Sasanian G et.al[20]. where the most common agent was drugs. In the study by Lan Zhou, Liang Liu, Lin Chang et. al.[18], the most common poison was the rodenticide tetramine and in the study by Sharma BR, Nidhi Relhan, Neha Gupta et.al.[15], the most common poison was aluminium phosphide. Easy availability over the counter as well as an accessible poison in the form of insecticides especially in the house of farmers, cost effectiveness, fatal nature of the compound, awareness about toxicity of compound among general population make organophosphorus compound the most common poison encountered. Its effectiveness as a rodenticide, regular use in grain storage, unsafe storage practices and easy accessibility as a household poison especially among women, makes Phosphide compounds second in popularity.

It was observed that maximum number of victims (34.53%) succumbed to death within 1-7 days of consumption of poison, followed by 17 cases (15.45%) were brought dead. Only 6.36% of cases survived for less than 1 hour. This is in contrast to the findings noted in the study by Shetty AK, Jirli PS, Bastia BK[19].

The intermediate clinical manifestations observed in Organophosphorus compound consumption could be responsible for the delayed deaths. In addition, the effective therapeutic measures would have prolonged the toxic sequelae of Organophosphorus compounds resulting in death at a later date. Majority of the time, the victims ingest formulated Organophosphorus compounds instead of pure active ingredients. Different compounds such as xylene or cyclohexanone maybe be used as solvents. The clinical manifestations of poisoning with these solvents are often poorly studied and uncertain[21]. Other individual-specific factors like general condition of the patient, tolerance, delayed gastric emptying time, response to treatment could have also contributed to the delayed deaths. In our study, it was observed that 10 cases of Phosphide poisoning succumbed to death in 1-7 days. Even though phosphides cause immediate deaths due to rapid toxicity, the delayed deaths in our study may be due to low dosage, reduction in potency due to interference with atmospheric moisture[22] and effective management of dysrhythmias which may otherwise lead to immediate death.

Conclusion

Public education programs about suicide are an important component of pesticide-suicide prevention programs. They suggest that public education should focus on convincing the public that suicide is an important public health problem that can be prevented. Educational activities should aim at changing the prevailing attitudes. Significant number of deaths can be prevented by providing local first-aid kits, better training of physicians, faster transportation to hospitals, and ensuring that adequate supplies of antidotes and essential hospital equipment are readily available. Poison information centres are uniquely centralized repositories of data about human exposures to chemicals, including information about the agents involved, the circumstances giving rise to exposure, and the health effects of exposure. Establishment of such centres help reduce the incidence of poisoning by identifying emerging toxicological hazards, stimulating preventive measures by manufacturers and regulators; and assessing the efficacy of such measures.

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