Epidemiological profile of poisoning deaths in South Delhi Region of India

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Abstract

The trends of poisoning differ from country to country and also from one region to another within the same country due to differences in the socio-economic condition, cultural practices and ease of availability of poison or drug among various regions. There is paucity of accurate data regarding fatal poisonings in India due to lack of enough Poison Information Centers, which hampers the prevention and control of poisoning deaths. A cross sectional observational study based on autopsy and laboratory investigation was carried out over a period of 2 years, at the Department of Forensic Medicine and Toxicology, All India Institute of Medical Sciences New Delhi to find out the distribution and determinants of the fatal poisonings in South Delhi region of India. In this study, poisoning deaths accounted for 4.65% of all medico-legal autopsies done during the study period. Majority of poisoning fatalities were observed among male, age group 21-40 years, married, and middle class families. Majority of cases were suicidal. Insecticides and rodenticides were most common killer poisons followed by alcohol. Mental illness or mental depression was present in 34.5% of cases, while substance abuse was encountered in 26.1% of cases. Past history of prolonged physical illness was present in 3.4% of cases.

Keywords: Poisoning, Insecticide, Aluminium Phosphide, Autopsy, Poison Information Center.

Introduction

Poisoning has become an important cause of mortality worldwide. But the magnitude of problem and global distribution of poisoning deaths is largely unknown. According to an estimate by World Health Organization (WHO) deliberate ingestion of poison accounts for 370000 deaths annually. While in the year 2012 alone an estimated 193460 deaths were caused by unintentional poisoning.(1) The trends of poisoning differ from country to country and also from one region to another within the same country due to differences in the socio-economic condition, cultural practices and ease of availability of poison or drug among various regions. Apart from geographical differences, trends of poisoning have also changed over the last several decades, as more and more new poisons and drugs are coming out each year and some of the old ones are getting obsolete. In cases of fatal poisoning, there is need for meticulous autopsy and rapid screening tests to identify the nature of poison involved, even when the circumstances of the death are apparently straightforward. Keeping in mind changing trends of occurrence of poisoning and lack of proper scientific prospective study in cases of fatal poisoning, this study was carried out to evaluate the distribution and determinants of the fatal poisonings in South Delhi region of India.

Materials and Method

This cross sectional observational study was carried out over a period of 2 years, at the Department of Forensic Medicine and Toxicology, All India Institute of Medical Sciences, New Delhi. All cases with alleged history of poisoning brought to the Department of Forensic Medicine and Toxicology, for autopsy were examined thoroughly. The demographic data about the cases were collected from the records submitted by the investigating authorities. Enquiry about the suspected poison was made by interrogating the investigating officer and the relatives, followed by meticulous autopsy in each case to find out the nature of poison. Samples were collected during the autopsy, which included blood, viscera, gastric and intestinal contents, as these samples are routinely collected in a case of suspected poisoning. Laboratory analysis of suspected poison was done at the in-house Toxicology Lab of the department. Only qualitative analysis for various poisons (except the snake bite cases) was done with the help of chemical tests & Thin Layer Chromatography to detect the presence or absence of a particular poison. The data so obtained, were analyzed using Epi Info software.

Results

During two year study period, total 2559 cases were brought for autopsy. Out of these 119 cases (4.65%) were of alleged fatal poisoning. Maximum cases occurred during the month of October (n=14, 11.8%) and lowest number of cases occurred during the months of February and March (n=7, 5.9%). Cases were more or less uniformly distributed with no significant clustering during any particular month. (Fig. 1)

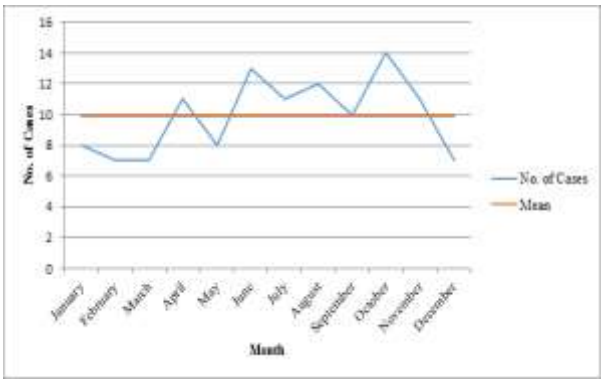

Fig. 1: Month-wise distribution of cases

Out of the total 119 cases 76 were male (63.9%) and 43 were female (36.1%). Male to female ratio was 1.77:1. It was found that the maximum number of cases occurred in the age group of 21-30 years (n=62, 52.1%), followed by age group of 31-40 years (n=31, 26.1%). These two age groups, in combination, accounted for a total of 93 cases (78.2%). It was observed that 71.4% (n=85) were married compared to 28.6% (n=34), who were unmarried. Ratio of married to unmarried was 2.5:1. A significantly large proportion of cases belonged to middle class (n=80, 67.25%), 35 cases (29.4%) belonged to lower class and only 4 cases (3.4%) were from high socioeconomic status. Out of the total 119 cases 25.2% (n=30) were self-employed and ran their own business. This group was closely followed by housewives (n=29, 24.4%) and labourers (n=26, 21.8%), while farmers were represented by only 2 cases (1.7%). A significant proportion of cases was formed by the students (n=17, 14.3%).

On laboratory analysis of biological samples obtained during autopsy It was observed that the aluminium phosphide was the most commonly used poison (n=47, 39.5%), followed by alcohol (n=20, 16.8%) and organophosphates (n=11, 9.2%). In 4 cases (3.4%) no poison could be detected by available means. These poisons (n=115) are again categorized according to their nature and usage and it was found that most of the deaths due to poisoning were caused by insecticides/ rodenticides (n=69, 60%), followed by recreational substances (n=22, 20.9%) and household products (n=11, 9.6%). (Table 1)

Table 1: Distribution of cases according to poison detected

Name of Poison	Cases: n (%)
Aluminium phosphide	47 (39.5%)
Acid	6 (5%)
Alcohol	20 (16.8%)
Benzodiazepine	1 (0.8%)
Carbon mono oxide	3 (2.5%)
Carbamate	2 (1.7%)
Cleaner/ detergent	2 (1.7%)
Hair dye	3 (2.5%)
Organophosphate	11 (9.2%)
Organochloride	3 (2.5%)
Opiods	4 (3.4%)
Snake/insect bite	7 (5.9%)
Zinc phosphide	4 (3.4%)
Copper sulphate	2 (1.7%)
No poison detected	4 (3.4%)
Total	119 (100%)

As far as manner of death is concerned a great majority of cases (n=85, 71.4%) were suicidal, followed by accidental (n=33, 27.7%). During two year study period we found only one case of homicidal poisoning. Mental illness or mental depression was present in 34.5% of cases (n=41), while substance abuse was encountered in 26.1% of cases (n=31). Past history of prolonged physical illness was present in 3.4% of cases (n=4).

For an in depth analysis of data multiple comparisons among various parameters were done. Incidence of deaths due to acute alcohol intoxication was considerably high among laborers compared to other occupational classes (42.3% v 0.9%, p-value<.001), which was found to be statistically significant. It was found out that the prevalence of substance abuse was significantly higher in accidental poisoning deaths compared to non-accidental poisoning deaths (63.6% v 11.62%, p-value<.001) and this was statistically significant. The prevalence of mental illness and mental depression was higher among suicidal poisonings as compared to non-suicidal poisonings (44.7% v 8.8%, p-value<.001), which was statistically significant.

Discussion

Comparison between various studies on mortality due to poisoning is very difficult because pattern of poisoning differ from country to country and region to region due to obvious differences in the demographic profile of various regions and also availability and accessibility of poisons and drugs differ among various regions. In our study 119 cases were of fatal poisoning which constituted 4.65% of all autopsies during the same period, which was similar to observation made by Murari et al[2] who reported incidence of poisoning to be 5.43% at LHMC, New Delhi. Sharma[3] also reported 5% of all deaths were due to poisoning at RIMS, Manipur. This finding was in marked contrast to studies conducted by Dhattarwal et al[4] and Kumar A et al,[5] who reported incidence rate of poisoning deaths to be as high as 23.4% and 17.4% at Rohatak and Chandigarh respectively. It might be due to fact that areas, surrounding Rohatak and Chandigarh have more population with agricultural background, having easy access to insecticides and pesticides, as compared to South Delhi, which is a metropolitan area.

In the present study maximum number of cases occurred in the age-group of 21-30 years (52.1%), followed by 31-40 years (26.1%), which is significant because these two age-groups also represent the most productive years of life. This finding was similar to study conducted by Murari et al[2] at LHMC, New Delhi and Kumar A et al[6] at Chandigarh. According to Aggarwal NK et al[7] and Gupta BD et al[8] maximum incidence of poisoning was seen in second and third decade of life. This finding might be due to fact that this age group is more exposed to stress and strain of life.

The males (63.9%) were more involved compared to females (36.1%). Male to female ratio was 1.77:1. This finding was consistent with multiple authors.[2,4,5,7,8,9] Only Samaria et al[10] reported female preponderance, with male to female ratio being 1:1.4 in their study. This suggests that males are more exposed to hazardous substances, possibly because of their working habits and lifestyle.

In our study most of the victims were married (71.4%), which was very much similar to observation made by Kumar A et al[6] and Batra AK et al[11] who reported 73.5% and 63% poisoning victims were married. This observation suggests that possibly marital disharmony is a significant factor in deaths due to poisoning.

As far as most affected occupation class is concerned, the striking observation that came out from this study was that most commonly affected group was formed by the persons who were self - employed and ran their own business, accounting for 25.2% of all cases. This group when combined with the service class accounted for 34.4% of cases. This was contrary to studies carried out by Gupta BD et al[8] and Batra AK et al[11] who reported maximum number of poisoning deaths among farmers. In our study, students formed a sizeable proportion of all cases of fatal poisoning, which is suggestive of rise in the stress level among students. This finding also emphasizes the need to reform our education sector, which until now, only promotes unhealthy competition among students.

As far as socioeconomic status is concerned, we found maximum number of cases belonged to middle class (67.25%) and only 3.4% cases were from higher class. Whereas in the study of Gupta BD et al[8] maximum number of poisoning cases belonged to lower socio-economic class (87.1%).

In the present study aluminium phosphide has emerged as the top most killer poison responsible for 47 out of 119 fatalities (39.5%). It was followed by alcohol (16.8%) and organophosphate (9.2%). This trend was exactly similar to that reported by Kumar A et al[5] who observed commonest causative agent was aluminium phosphide (38.9%), followed by alcohol (8.4%) and organophosphorus compounds (6.9%). Most of the studies from North India, e.g. Dhattarwal et al,[4] Aggarwal NK et al,[7] and Murari A et al,[2] indicated, although maximum number of cases by aluminium phosphide but followed by organophosphates and alcohol. Whereas studies from South India, by Singh B et al[9] and Kiran N et al[12] found organophosphorus compounds were most common agents, responsible for 65% and 60.14% of poisoning deaths respectively. The reason for high incidence of aluminium phosphide poisoning in North India may be its easy availability, low cost and extensive use.

In present work, we found that incidence of deaths due to acute alcohol intoxication was considerably higher among laborers compared to other occupational classes (42.3% v 0.9%, p-value<.001), which was found to be statistically significant. Whereas Kumar A et al[6] in a study from Chandigarh region reported high incidence of acute alcohol intoxication among the armed force personnel.

In our study, we observed 7 cases of snake/insect bite, which showed a definite seasonal trend, 5 out of 7 cases were observed during rainy season (June-September), this finding was consistent with Brunda et al[13] and Lal P et al[14] who observed similar trend.

In the present study, most of the cases were suicidal or intentional (n=85, 71.4%), followed by accidental (n=33, 27.7%). Similar observations were made by multiple authors.[2,4,5,7,8,9] Only Liu Q et al[15] in China observed a contrasting trend, where manner of death in 64.7% cases was accidental, suicidal intent was present in 25.2% of cases and homicide in 3.7% of cases.

We found a statistically significant association between past history of mental illness/ mental depression and suicidal poisoning death. Prevalence of mental illness/ mental depression was higher among suicidal poisonings compared to non-suicidal poisoning (44.7% v 8.8%, p-value<.001). Similarly we found that prevalence of substance abuse was significantly higher among accidental poisoning deaths compared to non-accidental poisoning deaths. These findings are important from preventive point of view. These two findings are consistent with the findings of Hempstead K et al[16] who also observed similar trend.

Conclusion

In present study, poisoning deaths accounted for 4.65% of all medico-legal autopsies done during the study period. Majority of poisoning fatalities were observed among male, age group 21-40 years, married, and middle class families. Insecticides and rodenticides were most commonly involved in fatalities. Majority of cases were suicidal. Incidence of fatalities due to alcohol intoxication was considerably higher among laborers compared to other occupational classes. Therefore it is recommended to set up Local Poison Information Centers for more accurate reporting of poisoning cases, strengthening the laws regulating the sales of pesticides, and to educate people, particularly laborers to adopt a responsible drinking behavior.

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