Research Article

Changing epidemiology of poisoning in Central India: shifting poles from male farmers to young house wives

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Abstract

Introduction: Acute self infliction of poisoning is very common among young in developing countries. The epidemiology of poisoning changes time to time and varies region to region. In south India, organophosphorus compound poisoning has been more common as compared to Aluminium phosphide poisoning in north India. All over India males are more commonly reported to poison themselves. Poisoning in farmers has been reported more commonly than in any other profession. Madhya Pradesh is situated in central part of India, where agriculture is the predominant source of income. There is a knowledge gap in epidemiology of poisoning in this region. **Methods:** This is a hospital based observational type cross sectional study over nearly 2 years. **Results:** Out of the 550 number of study participants about 90% were younger than 40 years. Females were more common than males in all age groups. Poisoning was more common in married population in both the genders. House wives followed by unemployed students were the most vulnerable populations. Farmers constituted only about 10% of total cases. Organophosphorus compounds were the most common type of poisoning contributing to almost one fourth of the total cases followed by Zinc phosphide, Aluminium phosphide, oleander and ethylene dibromide poisoning in decreasing order. The overall mortality was 9.8% (n=54). The case fatality rates of various agro-chemicals in decreasing order were Aluminum phosphide (44.7%), ethylene dibromide (17.6%), and organophosphorus (7%). These 3 poisonings contributed to 92.5% of all deaths. Death was more common when the time lag to hospitalization was > 6 hours. **Conclusion:** Younger age group, female sex and housewives were the most vulnerable group. The case fatality rate of various poisonings in decreasing order were Aluminum phosphide (Celphos) poisoning followed by EDB and OPC.

Key words: Organophosphorus poisoning, celphos poisoning, zinc phosphide poisoning, farmer suicide, pattern of poisoning in India.

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Introduction

Self infliction of toxic substances in human civilization is known since time immemorial. World Health Organization (WHO) estimates more than 3 million cases of acute poisoning and 3 lakh deaths globally per year [1]. The incidence of acute poisoning is rising in India as well as globally. Poisoning is a major unnatural death in developing countries, though the type of poison and the associated morbidity and mortality varies from one place to another. The epidemiology of poisoning usually changes in an area over a prolonged period of time [2]. The epidemiology of poisoning in a region

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depends on various factors which include availability and accessibility to poison, socioeconomic status of an individual, cultural influences and many more. In developed countries, the rate of mortality from poisoning varies only from 1- 2 % [3-5]. According to the WHO, 99 per cent of the fatal cases seen in developing countries are predominantly among the farmers [6]. Poisoning is the fourth most common cause of mortality specially in rural India where the mortality rate varies from 15- 30% [7,8]. Easy availability and low cost of hazardous chemicals play a major role in poisoning in developing countries [9,10].

Literature search on epidemiology of acute poisoning in India reveals changing pattern over the time [2,7,10-12]. In north India, aluminium phosphide (ALP) is the most common type of poisoning where as organophosphorus compounds (OPC) are more common in south India [13]. There is a lot of hue and cry in recent times regarding the farmer-suicides in India including this locality. There is absolutely a knowledge gap regarding the epidemiology of acute poisoning in central India as there is no published literature from this part of the world. We conducted the study to bridge the gap in knowledge regarding the epidemiology of acute self inflicted poisoning in Central India.

Material and methods

This is a hospital based observational cross sectional study conducted in the region of Rewa, Madhya Pradesh from November 2010 to September 2012.

Inclusion criteria

1.All the suspected poisoning cases (reliable history, presentation of remaining stuff / container by the relatives and clinical suspiciousness).
2. Age more than 15 yrs.

Exclusion criteria

1.Patients with known pre existing co-morbid conditions like diabetes, hypertension, chronic liver disease, chronic renal failure and neurological disorders.
2.Unwilling to give informed consent by patient or patients relatives.

After strict inclusion and exclusion criteria 550 cases were recruited into the study. All the cases undergone detailed clinical examination. They were treated in intensive care unit (ICU) or general ward as per the need. All the patients were investigated for complete blood count, liver function test, kidney function test, serum electrolytes and ECG.

Result

A total number of 550 cases were included in the study. The most common age group of poisoning was noted to be in 15-30 years (72.3%, n=398). Among this age group 181 were male as compared to 217 females. In this age group 48.6% (88/181) of males and 58% (126/217) of females were married. Among all the cases 62.5% (155/248) of males and 69.8% (211/302) of females were married (Table-1). All the patients beyond 30 years were married. The 2nd most common group was in 31-40 years (16.7%). The frequency of poisoning decreased as the age advanced (Table-1). The eldest patient was of 65 years male. Females outnumbered the males in all the age groups (Table-1). Out of the total number of 550 cases 37% were house wives (204/550) of various age groups. Unemployed students were the next most vulnerable group constituting 26.7% (147/550). Farmers constituted only 10.9% (60/550) of the total cases (Table-2). Among all the cases about 75 % belonged to lower socio-economic strata (Table-2). Suicidal intent was identified in 92.1% followed by accidental (5.8%) and alleged homicidal in (2%) cases.

In 29.8% (164/550) of cases the exact type of poisoning could not be identified even after thorough interrogation. OPC were the most common type of poisoning, contributing to almost one fourth of the total cases (23.2%, 128/550). The next most common types were Zinc phosphide (19.6%, 108/550), Aluminium phosphide (15.4%, 85/550), oleander (4.1%, 23/550) and Ethylene dibromide (EDB) (3%, 17/55) (Table-3). All cause mortality of 54 cases (9.8%) were noticed out of the total number of 550 hospitalised cases. Only 3 poisonings viz. Aluminium phosphide (38/54), OPC (9/54) and EDB (3/54) contributed to 92.5% (50/54) of total death. While looking at the case fatality rate of the different poisonings, Aluminium phosphide was having the highest mortality rate (38/85=44.7%) followed by EDB (3/17=17.6%) and OPC poisoning (09/128=7%) in descending order (Table-4). No cases of death was reported in the poisoning due to Zinc phosphide, sedatives, oleander and vermilion poisoning where as 4 cases of death was reported in the unknown poisoning group. While looking at the temporal pattern of time of death, 48.1% (26/54) of death occurred when the cases were

hospitalised after 6 hours of ingestion of poison. Early death i.e. within 3 hours of ingestion was observed in OPC, EDB and few unknown poisons (Table-5).

Table 1: Distribution of cases according to age, sex and marital status

Age group in years	Male		Female		Total
	Married	Unmarried	Married	Unmarried	
15 to 30	88	93	126	91	398
31 to 40	40	00	52	00	92
41 to 50	15	00	16	00	31
>50	12	00	17	00	29
Total	**155**	**93**	**211**	**91**	**550**

Table 2: Distribution of cases according to occupation

Occupation	n	%
Housewife	204	37.09
Student	147	26.72
Private worker	92	16.72
Farmer	60	10.90
Businessman	47	8.57
Total	**550**	**100**

Table 3: Distribution of cases according to intent of poisoning

Poison	Intent of Poisoning			Total
	Suicidal	Accidental	Homicidal	
Unknown	150	07	07	**164**
Organophosphorus	123	04	01	**128**
Zinc phosphide	96	11	01	**108**
Celphos	81	02	02	**85**
Oleander	19	04	00	**23**
EDB	15	02	00	**17**
Barbiturate	14	01	00	**15**
Vermilion	09	01	00	**10**
Total	**507**	**32**	**11**	**550**

Table 4: Distribution of cases according to different poison and mortality rates

Type of poison	No of cases	No of death	Case fatality rate in %
Organophosphorus	128	09	7.03
Celphos	85	38	44.70
EDB	17	03	17.64
Zinc phosphide	108	00	0
Sedative	15	00	0
Oleander	23	00	0
Vermilion	10	00	0
Unknown	164	04	2.43
Total	**550**	**54**	**9.8**

Table 5: Distribution of mortality in relation to time lag for hospitalisation

Type of Poison	Total no of death	Time lag for hospitalization		
		0-3 hrs	3-6 hrs	>6hrs
Organophosphorus	09	04	04	01
Celphos	38	02	11	25
EDB	03	01	02	00
Unknown	04	02	02	00
Total	**54**	**09**	**19**	**26**

Discussion

Out of the 550 cases about 90% of cases were younger than 40. To be more specific 72.3% of cases were younger than 30. This is in accordance to different studies carried out earlier [14-16]. Siwach et al. 1995 reported 70 % of poisoning was seen in age group between 15 – 30 years in North India [13]. A similar study from Andhra Pradesh in south India reports 40% of all cases in the age range of 21-30 followed by 11.6% in the age group of 31-40 [17]. This young age presentation has been explained by various authors because of more emotionally liable, financial insecurity, failure in love, peer rivalry, conflicts with parents and spouse. Out of the 248 cases in male 62.5% (n=155) and out of 302 cases in female 69.8% (n=211) were married. Marriage being a social custom, almost similar incidence (57% in male and 73% in female) was reported from an autopsy based study in this region [16]. In our study the females outnumbered the male cases in all age groups (302 Vs 248).

Eddleston M et al. 2000 have also reported females comprising 57% of total cases in their case series [18]. Similar findings of female preponderance in acute self infliction of poison found in other places like Istanbul and Japan [19-21].

The female dominance in all these studies have been described because of more labile emotions, illiteracy, ignorance, family conflicts, marital disharmony, economic crisis, unemployment and indifferent approach of family members to their chronic illness. However this finding is in contrast to previous studies from India where males outnumbered the females [2,17, 22,23].

The most common intent of poisoning in our study was suicidal (92.1%) followed by accidental (5.8%). Similar findings were observed by various authors all over the globe [24-27]. Various substances have been used for self infliction of poisoning in various parts of world. It depends on the ease of accessibility and affordability at that region. India being a country of villages where agriculture is the main source of income, various agro-chemicals are the main source of poisoning. Among the various agro-chemicals, OPC remain the most common agent utilized for poisoning [14,15, 26]. This scenario is not different in nearby Asian countries e.g. Sri Lanka and Bangladesh [24,27].

Among the identifiable causes of poisoning, OPC was the single most culprit agent in about 25% of cases in our study. Other agro-chemicals down the list were Zinc phospide in about 20% of cases and Aluminium phosphide in about 15% cases.

All the 3 above mentioned agro-chemical compounds are common house hold objectives in agriculture predominant areas. These 3 compounds contributed to almost 60% of poisonings in this study. A recent study in South India showed OPC poisoning in 17.2% cases, drug overdose in 8.4% and unknown poisoning in 7.7% cases which were the 3 most common self inflicted poisons [17]. Aluminium phosphide was the most common poisoning in north India accounting up to 67.8% of cases in one study from Haryana [13].

This regional difference can be explained by following facts. Aluminium phosphide is predominant agro-chemical used for pest control in wheat farming which is the predominant staple food in north India where as OPC are the predominant agro-chemicals of pest control in rice fields of south India where people depend on rice more than wheat. OPC poisoning was the most common agro-chemical poisoning in studies conducted in north India before 1980 when Aluminium phosphide was not easily available [18,19,26].

Overall mortality due to poisoning was 9.8% (n=54) in our study. The case fatality rate was highest in Aluminum phosphide poisoning (44.70%) followed by EDB (17.64%) and OPC (7.03%). Our study was similar to the study from Andhra Pradesh where the overall mortality was 8.3% (n=186).[17] Sheu JJ et al. (1998) in their study of poisoning reported 18 to 23% mortality [31]. Louriz M et al. (2009) observed that mortality associated with Aluminum phosphide poisoning was 49% in Morocco [32].

Mathai et al. (2010) noted mortality of 59.3%.with Aluminum phosphide poisoning [33]. With EDB poisoning mortality of 12% has been reported by Nigam et al. (2010) [34]. In a study on OPC poisoning conducted by Adlakha et al. (1988) mortality was 11% [35]. Uma et al. (2011) in their study on OPC poisoning reported 17% mortality [36].

The varying case fatality rate depends on many factors such as nature of poison, amount consumed, level of available medical facilities and time lag between the consumption and 1st contact with medical care. Most of the mortality in our patients occurred in whom the time lag was > 6 hours for hospitalization. Various studies conducted earlier reported a significant relationship of time lag before hospitalization & mortality in cases of poisoning [36-38]. This association seems self explanatory that early decontamination and appropriate treatment can decrease the mortality.

Conclusion

Pattern of poisoning in Madhya Pradesh, a state in Central India is different from rest of the country. OPC was the most common agent of self inflicted poison, followed by, Zinc phosphide, Aluminum phosphide, yellow oleander and EDB in that order. Intent of poisoning was mostly suicidal like most other earlier studies. Nearly 90% cases were younger than 40 years. Younger age group, female sex and housewives were the most vulnerable group.

The case fatality rate of various poisonings in decreasing order were Aluminum phosphide (Celphos) poisoning followed by EDB and OPC. Knowledge and awareness among the public, stringent legislation for sell of agro-chemical compounds with political support, availability of specific antidotes at primary health centers with a quality referral system to tertiary health care center are the need of the hour to lower the rate of poisoning and to improve the outcome.

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