

## Epidemiological Profile of Pesticide Poisoning Cases in Bijapur, Karnataka in Southwest India: a Retrospective Study

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### ABSTRACT

**Background:** Pesticide poisoning is a major public health problem in developing countries. Its usage has increased in recent and thus increased even its misuse to commit suicide. The aim of his study was to determine the epidemiological profile of fatal pesticide poisoning in and around Bijapur district.

**Methods:** This retrospective study was carried out at Department of Forensic Medicine, B.M. Patil Medical College, Bijapur, Karnataka in southwest India, with the fatal pesticide poisoning cases from 2003 to 2009. All collected data was analyzed in all possible aspects, to identify risk factors, most common offending agent and other epidemiological factors etc.

**Results:** During the study period a total 980 medico legal autopsies were conducted, amongst them poisoning were 240 (24.48%) cases. Out of these, 210 cases were due to fatal pesticide poisoning (87.55%). All collected data was analyzed in all possible aspects, to identify risk factors, most common offending agent and other epidemiological factors.

**Conclusion:** Agrochemical poisons, more so organophosphates are responsible for most of the poison related fatalities in the present study. Besides this, the establishment of specialized toxicological units for detection and management of poisoning cases at all hospitals and primary health care centers could considerably minimize the morbidity and mortality due to poisoning.

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► *Implication for health policy/practice/research/medical education:* Pesticide Poisoning Cases in Bijapur, Karnataka in Southwest India

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### 1. Introduction:

Poison is a substance capable of producing damage or dysfunction in the body by its

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chemical activity. It can enter the body in various ways to produce general or local effects. Poison and poisoning are known since time immemorial. Pesticides are compounds that are used to kill pests which may be insects, rodents, nematodes, mites, ticks, unwanted weeds or herbs. They are used in most of the countries around the world to protect agriculture and horticulture

crops against, damage; they are also used as domestic insecticides (1).

Acute poisoning by pesticides is becoming a serious global problem. Pesticide poisoning account for an estimated three million cases of severe poisoning worldwide in each year, with approximately 200,000 deaths. More than 90% of these cases are reported from developing countries, such as India (2, 3). It is developing a level which can be called a "Social Calamity" (4).

At present due to vast development in all fields of life like industries, medicine, and agriculture a significant number of new compounds have appeared as new poisonous substances, which lead to more number of poisoning cases. Even though the advanced medical treatment and awareness, the deaths due poisoning cases are increasing day by day.

As various chemicals are in use in modern era, they are very handy for misuse or accidental calamity as well. Most of the people prefer them for the purpose of suicide, as poisons leading peaceful death. Although the poisoning deaths and deaths in road traffic accidents are very nearly the same, great public concern is given to road traffic accidents only, thus poisoning deaths being neglected. Therefore, an alarm for early diagnosis, treatment and prevention so also research needs to follow. Such knowledge of general pattern of poisoning in a particular region can hopefully lead to early diagnosis and control of poisoning crises, thereby bringing down the morbidity and mortality to minimum. An attempt has made to find out some epidemiological factors, pattern and other significant features of poisoning

The aim of his study was to determine the epidemiological profile of fatal pesticide poisoning in and around Bijapur district as this part of Karnataka has large agriculture area taking into account demographic data, place of consumption, type of poison involved and the manner of poisoning. Sri B M Patil Medical College Hospital being a tertiary care centre receives poison patients from different parts of North Karnataka.

## 2. Materials and Methods:

This retrospective study was carried out at Department of Forensic Medicine and Toxicology, Sri. B.M. Patil Medical College, Bijapur, Karnataka in southwest India. We examined all available files of inquest papers, autopsy reports, case papers and toxicological analysis into the fatal pesticide poisoning cases from 2003 to 2009.

We used standard Performa to obtain data from the records to ensure consistency for the whole sample. Information collected includes age, sex, place of death, medical attention received, cause and manner of death, report of chemical analysis. We extracted, if present any other relevant information, such as history of psychiatric illness, drug or substance abuse. All collected data was statistically analyzed.

## 3. Results:

This study revealed that a total of 980 medico legal autopsies were conducted from 1<sup>st</sup> January 2003 to 31<sup>st</sup> December 2009. Poisoning cases constituted 240 in number (24.48%). Out of these 240 cases, 210 cases were due to fatal pesticide poisoning (87.5%).

Young adults belonging to age group 21-30 constitutes the majority, 80 cases (38.12%) of victims followed by 31-40 age group with 54 cases (25.56%). 11-20 age group had 28 cases (13.31%), 41-50 age group had 24 cases (11.4%), 51-60 age group had 13 cases (6.6%), 61-70 age group had 7 cases (3.2%), 71-80 age group had 3 cases (1.46%) was observed. Below ten years of age only one case was found (Table 1). Only one case found in the age group below ten years is 10 month old female baby who was given pesticide by her mother, constituting dyadic death. Maximum age observed was 80 years. Significant decrease in the higher age groups observed. Males outnumbered than females, the male female ratio being 2.6:1 (Table 2).

163 (77.6%) victims were from rural area while 47 (22.44%) were from urban area, (Table 3) Out of 210 total pesticide poisoning cases, 147 (70.2%) were married, 54 (25.6%) unmarried and 9 cases (4.2%) widowers (Table 4).

**Table 1:** Age wise distribution of poisoning cases

Age group	No of Cases (%)
0 – 10	01 (0.48)
11 – 20	28 ( 13.31)
21 – 30	80 (38.12)
31 – 40	54 (25.43)
41 – 50	24 (11.4)
51 – 60	13 (6.6)
61 – 70	07 (3.2)
71 – 80	03 (1.46)

**Table 2:** Sex wise distribution of cases

Male (%)	Female (%)
152 (72.38)	58 (27.62)

**Table 3:** Area wise distribution of cases

Rural (%)	Urban (%)
163 (77.6)	47 (22.4)

**Table 4:** Distribution of cases according to marital status

Married (%)	Unmarried (%)	Widow (%)
147 (70.2)	54 (25.6)	09 (4.2)

**Table 5:** Manner of deaths

Suicidal (%)	Accidental (%)	Homicidal (%)
192 (91.42)	16 (7.63)	02 (0.95)

**Table 6:** Distribution of cases according to socio-economic class

S – E status	No of Cases (%)
Upper	09 (4)
Middle	37 (18)
Lower	164(78)

**Table 7:** Distribution of cases according to religion

Religion	No of Cases (%)
Hindu	185 (88.1)
Muslim	21 (10)
Christian	04 (1.9)

History recorded at the time of admission and police inquest revealed that 192 (91.42%) cases were of suicidal in nature. 16 cases (7.63%) had occupational exposure resulting in accidental manner. Only two cases (0.95%) of homicidal pesticide poisoning were observed (Table 5). Different causes for deliberate consumption constitutes family quarrel, failures, financial problems, disease conditions like AIDS, mental illness and alcoholism. Survival period after admission in hospital were shown in table 6.

Out of total 210 fatal pesticide poisoning cases sent for chemical analysis, the reports of chemical analysis were received in 205 cases. Results of chemical analysis were negative in 10 cases. Accordingly, the analysis was then done. Among insecticides, the organo-phosphorus compounds were maximum 125 cases (64.3%), followed by organo-chloro compounds 49 cases (25.2%) and carbamates 21 cases (11.5%). Results of chemical analysis were shown in Table 7. In this part, chemical analysis is done at regional forensic science laboratory, Belgaum. Table 8 shows the distribution of cases according to the Socio-economic status. Majority of the cases were seen in the lower S–E status with 164 cases forming 78%. This is because majority of the population in our country and this part belongs to the lower S–E status. Majority of the victims were Hindus, total of 185 cases forming 89% as shown in table 9. The reason being most of the population in our country belongs to Hindus. Table 10 shows the distribution of cases according to the familial type. Most of the victims belonged to joint families with 117 cases forming 55.8%. The reason being most of the causes of deliberate consumption like family

**Table 8:** Distribution of cases according to family types

Family	No of Cases (%)
Nuclear	93 (44.2)
Joint	117 (55.8)

**Table 9:** Distribution of cases according to educational status

Education	No of Cases (%)
Illiterate	109 (52)
Below metric	57 (27)
Metric & above	44 (21)

**Table 10:** Distribution of cases according to period of survival

Duration of survival	No of Cases (%)
Brought dead	84 (40)
6 – 12 hours	85 (40.5)
12 – 24 hours	16 (7.6)
1 – 3 days	20 (9.5)
3 – 7 days	05 (2.4)

**Table 11:** Distribution of cases according to type of poison

Type of Poison	No of Cases (%)
Organo-phosphorus compounds	135 (64.3)
Organochloro compounds	53 (25.2)
Carbamate compounds	22 (11.5)

quarrel, failures, financial problems are seen in joint families. Table 10 shows the literacy levels of the victims. Majority of the victims were illiterate with 109 cases constituting 52%. This explains the fact that education among the population plays a very vital role for in preventing the morbidity and mortality due to poisoning compounds.

#### 4. Discussion:

Trends of the poisons in a region seem to be a function of need and availability of specific substances. Since last few years, there is a significant increase in the misuse of agrochemicals. Despite of tremendous progress in the field of medicine, pesticide poisoning continues to be the major cause of morbidity and mortality in India. The incidence of poisoning in the present study was 15.98%, which is comparable to other studies (5-14). The incidence of poisoning was higher in third decade of life followed by the fourth decade, in males, Illiterates, in married people and people from joint family, which is similar to most of the studies by various authors (5, 6, 8-14). This might be due to modern life style, stress, tension, family and social problems. The higher incidence was also observed in people from rural area, lower socio economic class. Most of the victims were Hindu, which can be explaining by the fact that major population of India is Hindu. Farmers and unemployed persons were more prone to death by poisoning in the present study; same as other studies (7, 8). Because of larger segment of our population comes from these groups and also cause of severe problems faced by farmers like crop failures.

Spot deaths were more in present study, which might be due to lack of awareness to go for the treatment, lack of proper treatment, distance between hospital and scene of incident, a firm commitment in the mind of suicides to die which did not allow them to go for the treatment and commonly the suicides choose agricultural poisons, reasons being their easy availability, the fatal dose of such poisons is in milligrams and most of these are classified under the category of extremely toxic and highly toxic group (14).

Nearly half of the victims survived up to 24 hours after consuming the poison. This emphasizes the fact that the initial 24 hour period is the most crucial period dictating the final outcome and stresses the early and energetic management of these cases. Most of the studies (5, 6, 9, 10, 13, 14) including this study show that most of the cases were suicidal deaths. This inference of manner of

death is based on history given either by police or and relatives. We tend to believe history because when person is claiming that death is due to suicide, he has nothing to hide, but when he claims that death may be due to accident; he may be having a motive to hide something. The suicides may be due to various stress factors coming from financial, social, family problems, low level of education, immaturity and many more aspects of life. Easy availability of poisons made them easy victims also.

Most of the authors have studied the incidence of type of poisoning according to the history given to them by police officers, relatives of the victim and by medical case papers (5, 6, 9, 10, 13, 14). While in present study we have scientifically and accurately calculated the incidence of poisoning according to the nature of poison after the chemical analysis that most common poison was one of the organophosphorus compounds in this region.

### 5. Conclusion:

Agrochemical poisons, more so organophosphates are responsible for most of the poison related fatalities in the present study. At the same time, the importance of organophosphorus compounds in agriculture cannot be overlooked. In developing countries like India, loss of crops due to pests cannot be ignored. Hence, instead of banning a particular pesticide, some measures could be adopted such as proper labeling of all pesticidal products, imparting awareness to the lay public about the hazards of pesticides and highlighting the safe practices of storage and use. Besides this, the establishment of specialized toxicological units for detection and management of poisoning cases at all hospitals and primary health care centers could considerably minimize the morbidity and mortality due to poisoning.

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