



## TOXICOLOGICAL PATTERN OF POISONING IN TERTIARY CARE CENTER OF SOUTHERN INDIA

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### ABSTRACT

**Background and Objectives:** Poisoning is a significant global public health problem which leads to nearly a million deaths each year. Incidence of poisoning in India is among the highest in the world. Despite the vast number, evidence on prevalence pattern in India is yet limited. **Objective:** The present study aimed to characterize acute poisoning cases with respect to the demographics, effect due to time lag and treatment outcomes. **Methods:** The cross sectional retrospective study was conducted from March 2021 to August 2022 (18 months) in private teaching hospitals. **Results:** Of all reviewed cases male over female predominance was observed. Maximum poisoning was observed in the age group 21-40 years with an increased incidence of male cases in age category 21-30 years. Household and agricultural agents were associated with most poisoning in which organophosphates were more common (31%). All cases were of Intentional poisoning and predominant in age category 21-30 years. Maximal exposure was observed between 12 am – 6 am. Maximum patients (76%) responded to the therapy given while 7% absconded, took discharge against medical advice or were referred to another hospital. The mortality rate was 17% with male predominance. **Conclusion:** The study concludes that the burden of poisoning demands strategies for prevention, identification and rational management providing optimal treatment outcomes. There was a statistically significant relationship between outcome in patient and delay in admission. It is important to educate people through drug awareness.

**KEYWORDS :** Poisoning pattern, Acute poisoning, Time lag, Treatment outcomes, Mortality.

### INTRODUCTION

Poisoning is a significant global public health problem ranking 45th in total death worldwide. Nearly a million people die each year because of suicide, and it is estimated that deliberate ingestion of pesticides causes 3,70,000 deaths each year. According to WHO data, in 2012 an estimated 1,93,460 people died worldwide from unintentional poisoning. Of these deaths, 84% occurred in low- and middle-income countries. In the same year, unintentional poisoning caused the loss of over 10.7 million years of healthy life.<sup>1</sup>

The incidence of poisoning in India is among the highest in the world. It is estimated that more than 50,000 people die every year from toxic exposure. According to the National Poisons Information Centre, New Delhi, analysis of poisoning calls showed that the highest incidence of poisoning was due to household agents (44.1%) followed by drugs (18.8%), agricultural pesticides (12.8%), industrial chemicals (8.9%), animals bites and stings (4.7%), plants (1.7%), unknown (2.9%) and miscellaneous groups (5.6%). The commonest cause of poisoning in developing countries is pesticides which includes organophosphates, carbamates, chlorinated hydrocarbons, pyrethroids and aluminium or zinc phosphide. The reason behind this upsurge is the agriculture based economics, poverty, unsafe practices, illiteracy, ignorance and easy availability of highly toxic pesticides. Majority of victims of poisoning are from lower socio economic status.<sup>2</sup>

Globally much is known and documented on poisoning. On the contrary, lack of updated information due to unavailability of published data and accessible databases, a few established poison centres and national surveillance is faced in India. Similar challenges have been observed in other countries such as China, Botswana and South Africa. This paucity of information on risk population, circumstances and toxic substances is a hurdle to effective poisoning prevention and targeted intervention programs. Therefore, the need for a current review of poisoning patterns in India is imperative. This study sought to characterize poisoning with regard to

demographic factors (i.e. age, sex and residence), common toxic agents used and their case fatality rates as well as the overall mortality rate of acute poisoning in and around Sullia town of Dakshina Kannada district.

Sullia is a town in Dakshina Kannada district in the state of Karnataka in India. According to the most recent census in 2021, the total population was 1,80,081 inhabitants. The taluka consists of 41 villages accommodates mainly farming areas and agriculture is the major occupation of the people of this district which provides easy accessibility of large number of chemicals and pesticides which in turn results in tremendous use of these agents for poisoning. The agricultural diversity of Sullia has resulted in increase of animal bites and stings and also use of pesticides for deliberate self harm and accidental exposures.

### METHODOLOGY

#### Study Area

The study was conducted in Sullia Taluka of Dakshina Kanada district of Karnataka, which consists of 41 villages and resides a total population of 1,80,081 inhabitants with a male to female ratio of 1:1.01 according to 2021 census. It forms a part of the topical monsoon land and therefore shows a significant seasonal variation in temperature and rainfall. The Sullia taluka resides many PHC's but KVGMC&H is the only one multispeciality higher center located in Sullia Town which engulfs a wide area of surrounding villages and remote locations like Peruvaje, Kodyala, Bellare, Kalanja, Aivarnadu, Jalsoor, Ajjavara, Aletty etc. These are the forest and agricultural areas where high number of chemical or pesticide poisoning can be observed. The private teaching hospital is a 600 bedded hospital with ICU and super specialties on call where patients are being referred from surrounding town like Madakeri, Hunsur etc.

#### Population and Sampling

The study was cross-sectional and made use of retrospective extraction of data from records available at the KVGMC&H.

All cases of poisoning available in the medical record departments were included in the study except the animal bites.

**Data Collection and Extraction:**

The records were collected from Medical Record Department of the KVGMC&H. The data collection period was from March 2021 to August 2022 (18 months). The cases were reviewed for gender, age, route and reason of poisoning, seasonal variation and agents. Poisonous agents were described and grouped in accordance with International Classification of Diseases [ICD-10].

**Statistical Analysis:** Data was collected in predefined forms. Chi Square test was used to determine the association between the variables. P <0.05 was used to determine significance.

**RESULTS**

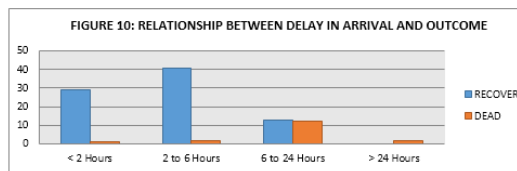
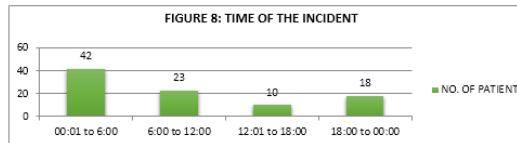
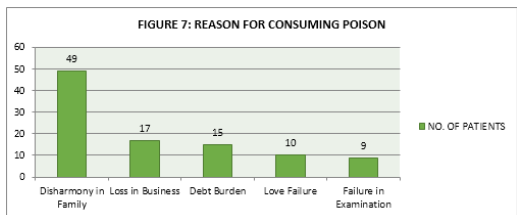
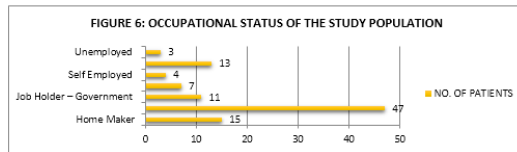
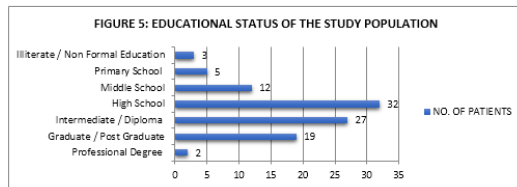
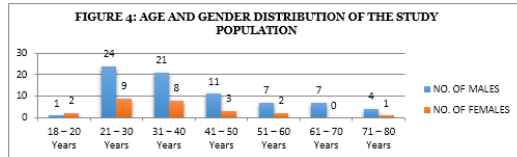
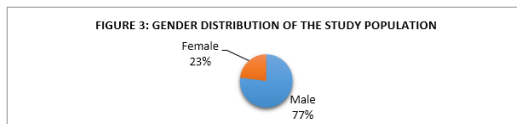
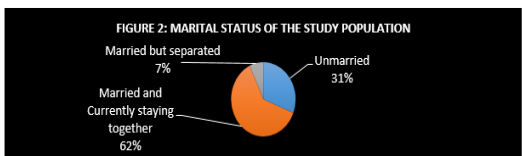
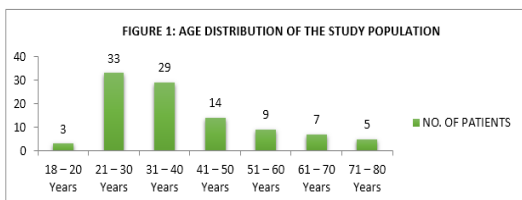
**Demography of poisoning cases and toxic agents involved**

A total of 100 cases were reviewed over a span of 18 months. The sex, age, reason of poisoning, route of poisoning, seasonal variation and agents involved in poisoning is according to the records available. The age of patients ranged from 0 – 80 years with a median age of 31 years. 62% were married and currently stayed along with their spouse. 31% were unmarried and 7% were married but separated (Figure 2). 77% were males and 23% of them were females among the study population. The male:female ratio was 3.34:1 (Figure 3). Maximum number of cases was observed in the age group of 21-30 years (33%) followed by 31-40 years (29%). Increased male cases were reported in age category 21-30 years (24%) (Figure 1). Maximum number of study participants had at least studied till high school and accounted for 32%. 27% were educated till intermediate or diploma. Only 3% had non formal education (Figure 5). 47% of the study population were employed in a private firm, followed by 15% who were home makers. 13% of them were students in the study group. Only 3% were unemployed (Figure 6). Poisoning was more during winter season.

**Reason and Route of poisoning**

Intentional poisoning was most common (100%) and maximum in 21-30 age category (33%) [p<0.05]. 49% of the study population cited disharmony in the family as the cause for consuming poison. 17% pointed at loss in business as the cause. 9% of them committed that failure in examinations was the cause for consuming poison (Figure 7).

Household and agricultural agents were used widely and agricultural agent along with alcohol were the second most used agent for intentional poisoning. 31% of the population consumed organophosphates, followed by 12% who consumed phosphides, 10% used carbamates. The proportion of patients who consumed antipsychotics, antidepressants, paracetamol and analgesic was 8%, 8%, 5% and 6% respectively (Table 1). Out of all cases reported, oral ingestion was the most common route of exposure (100%).



Outcome of Poisoning with Time of exposure, Time of Hospitalization and Time lag Maximum patients (76%) responded to the therapy given while 7% absconded, took Discharge against Medical Advice (DAMA) or were referred to another hospital [p<0.05]. Symptoms improved in 76% cases and did not improve in 17%. The mortality found in the present study was 17%. According to available data, 2 patient took DAMA discharge owing to poor financial status of the patient . and 5 patient was referred to higher center in view of deterioration condition. The outcome with poisoning with acids and alkali was very poor. This relationship was also statistically significant with p value less than 0.01.. An increased trend in consumption of alcohol along with toxic agent for self harm was observed, increasing the risk of aspiration, coma and respiratory failure leading to death.

Exact Time of Exposure (TOE) was unavailable in majority of the cases. According to available data, TOE was maximum

during 12 am – 6 am followed by daytime between 6am – 12 pm (Figure 8). Time of Hospitalization (TOH) was available in majority cases and was found highest during night 12 am – 6 am . The time lag between TOE and TOH was determined by the available data. Maximum time lag of 2-6 hrs was found in the study. Cases with time lag less than 2 hr showed better recovery (Figure 10).

**TABLE 1: RELATIONSHIP BETWEEN TYPE OF POISONING AND OUTCOME**

SNO.	TYPE OF POISON	RECOVERED	DEAD	CHI SQUARE VALUE	P VALUE
1	Organophosphates	26	5	0.0242	0.8764
2	Phosphides	10	2	0.0011	0.9738
3	Carbamates	9	1	0.3859	0.5344
4	Antipsychotics	8	0	1.781	0.1820
5	Antidepressants	8	0	1.781	0.1820
6	Paracetamol	5	0	1.078	0.2991
7	Acids	4	5	10.42	0.0012*
8	Alkali	3	4	8.596	0.0033*
9	Alcohol	3	0	0.633	0.4262
10	Analgesics	6	0	1.307	0.2529
11	Organochlorine	1	0	0.207	0.6491

## DISCUSSION

A wide range of age groups of both genders were found exposed and victims to poisoning, with male predominance. A similar trend was reported by studies conducted in Northern,<sup>3,4,6</sup> Southern<sup>8,9</sup> Western<sup>12,13,15</sup> and Eastern<sup>16</sup> regions of India and countries like Sri Lanka<sup>17</sup> and Uganda<sup>18</sup>. This trend may be due to increased occupational hazard and exposure of men to stress as they are the only earning members of a large family<sup>5,19</sup>. The high incidence of poisoning in age group 21-30 years may be due

to domestic, educational and employment related stress. Also the easy availability of household agents thereby explains the preponderance. Domestic violence, emotional status of young girls and their vulnerability to stress during puberty is the reason for increased female cases in age category 18-30 yrs. Rapid increase of indebtedness by farmers and failure to reimburse due to natural calamities like draught is the reason behind the increase in poisoning during summer season.<sup>10,11</sup> India being an agriculture nation, handling of pesticides is a routine practice by farmers and their family members. Household and agricultural agents were associated with most poisoning due to easy availability of these agents and inadequate knowledge to support their safe residential use.<sup>20</sup> Studies have shown that pesticide is the most common toxic agent involved in poisoning.<sup>21,22</sup> Drug poisoning was reported in 21% cases and were accidental with anti psychotic, anti depressant and antipyretic agents, which were also the case in United States according to Centres for Disease Control and Prevention,<sup>23</sup> followed by anti parasites and anti infective agents, anti epileptics, these drugs were also abused by children. This may be due to availability of drugs consumed by elders at home. Intentional poisoning was more common which was similar to other studies mentioned above. Household and agricultural agents were used widely. The reason behind this is easy availability of these agents in common household and agricultural use. Intentional poisoning cases more prevalent in age group 21-30 yrs may be due to increasing suicidal tendencies in this age group people due family dispute, domestic violence, and stress due to job/unemployment. Household poisoning were the most common cause of accidental poisoning which was contrary to findings of the studies conducted in North India where most accidental poisoning was due to animal bites and stings.<sup>24,25</sup>

This may be due to the difference in geography and occupation. The most likely explanation behind absconding/DAMA is due to low socioeconomic status of the patient and to refrain from medico-legal proceedings, lack of awareness and improper counselling to the patients. The reason behind referral to other hospitals is due to lack of specialty treatment in the hospital. The mortality found in the present study 17%, is higher compared to Eastern and Southern regions where it was 3.84%<sup>16</sup> and 7.5%<sup>7</sup> respectively and lower than Northern regions<sup>26</sup> other Western regions.<sup>14</sup> Predominance of males was found compared to females in death cases and similar pattern was observed in other study.<sup>27</sup> According to available data, most death was seen in adults which was similar to reports by Poison Statistics National Data 2014 that poisonings in Teens and Adults are more serious.<sup>28</sup>

Mortality due to organophosphates was highest according to the present study which was similar to the study conducted in South India. Aluminium phosphide is observed as the leading cause of poisoning in South India. An increased trend in consumption of alcohol along with toxic agent for self harm was observed, increasing the risk of aspiration, coma and respiratory failure leading to death. Maximum exposure during 6 pm – 12 am might be that people tend to over think about their problems more in the evening. Unable to cope up with the stress, they tend to take extreme measures and harm themselves.

## CONCLUSION

Increased intentional poisoning young population emphasize on importance of counseling and awareness about depression and stress affecting the major strata of the society which increases suicidal tendencies. Awareness and education among the population about safety from hazardous chemicals at household and occupational level is a strong indication to prevent accidental poisoning. 49% of the study population cited disharmony in the family as the reason for consuming poison. Maximum cases reported with time lag of 2-6 h suggests the need for awareness about first aid in emergency situation at primary healthcare level. There was a statistically significant relationship between outcome in patient and delay in admission. The study was conducted retrospectively by collecting the data from patients admitted to KVGMC&H Sullia, which gave vital information about poor socio-economic details of most of the patients. Cases referred from other hospitals lacked detailed patient history. The time of exposure and admission were not correctly determined in patient referred from other hospitals.

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