



Pattern of Deliberate Self-Poisoning in Central Kerala – A five-year Retrospective Study

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ARTICLE INFO

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How to Cite this article: Indira M., Pattern of Deliberate Self-Poisoning in Central Kerala – A five-year Retrospective Study. Journal of Indian Society of Toxicology 2019;15(2):20-24. DOI: [jst.org.in/10.31736/2019v15i2/p20.pdf](https://doi.org/10.31736/2019v15i2/p20.pdf)

Keywords:

Pesticide poisoning, plant poisoning, drug poisoning, case fatality, regulation of pesticides, suicide prevention

Conflicts of Interest and Fundings: Nil

Received – 22nd Dec2018

Accepted – 12th Jan 2019

Published – 30th Jun 2019

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Published at JIPMER, Pondicherry, 605006, INDIA Subscription & payment related queries at: toxicology@aims.amrita.edu and rest all types of queries related to the journal to be done at drambika_editor@jist.org.in

ABSTRACT

Background: There's a change in pattern of suicide observed globally with a substantial decline in pesticide suicide in recent years.

Materials and methods: A retrospective analysis of case records of patients admitted with DSP in medical wards in a tertiary care center from January 2010 to December 2014 was done to find out the various agents used for deliberate self-poisoning (DSP), their case fatality (CF) and to assess the pattern of DSP over the 5 years.

Results: There were 2214 males and 1693 females in the study population. Mean age was 34.94 ± 15.7 years. Majority of patients consumed pesticides ($n=2011$), particularly cholinergic pesticides ($n=890$). Higher CF was seen for corrosives (19.7%) and pesticides (18.4%) whereas plant poisons (5%) and drugs (2.03%) showed low CF. There was reduction in number of pesticide, increase in plant and drug poisoning in each year. 394 (10.2%) patients expired, with a mortality of 13.8%, 11.4%, 8.1%, 9.3%, and 8.6% in each year respectively. Majority of death occurred in pesticide group than in non-pesticide group ($n=312$, OR 4.06, 95% CI 3.16-5.23, $p<0.0001$). Among the pesticides, death was higher in cholinergic pesticide group than non-cholinergic pesticides ($n=204$, OR 2.8, 95% CI 2.2-3.6, $p<0.0001$).

Conclusion: Pesticides, especially cholinergic pesticides were the commonest group of agents used for deliberate self-poisoning in the study. There was a reduction in overall mortality each year due to self-poisoning over the study period with a reduction in pesticide related admissions each year. Regulation of pesticide use should be considered while planning prevention strategies of suicide.

INTRODUCTION

Intentional self-harm is a major cause of mortality worldwide, especially in the young population according to WHO mortality data base. Majority of this come from South Asian countries where pesticide poisoning constitutes major cause of death.¹ More than one lakh people die every year in India by self harm as per report of National Crime Bureau and the suicide mortality showed decline from 2010 to 2014 followed by an increase in 2015.² There's a change in pattern of suicide observed globally also with a substantial decline in pesticide suicide in recent years.³ Mortality in deliberate self poisoning (DSP) is 10 to 20% in Asian countries while it is 0.5% in western countries and the difference is mainly attributed to the agents used for suicide attempt.⁴ The intent of suicide in those committed suicide may not be high as there may be other intentions of the act like seeking attention, showing distress and doing revenge.⁵ Case fatality (CF) of agents used for the act can determine the outcome in low intent suicide attempts.⁶ So it is important to find out the common agents used for DSP in an area and their CF which can determine the survival of patients. In India agricultural pesticides especially organophosphates are the commonest suicide method.⁷ Previous reports have shown that pesticide poisoning is a common mode of DSP and suicide in Kerala.^{8,9} Organophosphates share common mechanism of action, but each compound vary in their lipid solubility, time of onset and duration of action; and thereby varying in their lethality.¹⁰ So it is important to find out individual compounds used for DSP in order to plan management and preventive strategies. This study was conducted to find out the various agents used for DSP in central Kerala, to find out the more harmful agents by calculating the case fatality (CF) of each agent and to assess the pattern of DSP over the 5 years.

MATERIAL AND METHODS

We conducted a retrospective case sheet analysis of deliberate self-poisoning cases admitted in ICU and general medical wards during the period from January 2010 to December 2014. The hospital is 1600 bedded tertiary care hospital that caters nearby three districts (with a total population of 10.03 million) of Kerala State of India. Clearance from institutional ethical committee was obtained before the commencement of the study. The records were collected from the Medical record library by searching the term 'deliberate self-poisoning' or 'poisoning' as diagnosis. Alternately we collected the

inpatient numbers of poisoning cases entered in the medico legal case register and searched the library data base. We collected data on the patient demographic characteristics, date of admission and discharge or death, agent used for self-poisoning and the outcome by using a standardised form. The chemical name of each agent was collected as far as possible or the collective term used to record the poison was noted like plant poison or drugs. The outcome was recorded as relieved at discharge, expired or went against medical advice. Data was analysed using SPSS version 15.0. Continuous variables were expressed using mean and median. Simple descriptive statistics using proportions were done. Chi-square test was used to find association between binary variables.

RESULTS

During the five year period from 2010 to 2014, 3907 patients were admitted with self-poisoning. There were 2214 males and 1693 females. Mean age of study population was 34.94 ± 15.7 years. Demographic features of study population is given in Table 1. Various agents used for DSP are shown in Table 2. Among the study population, 394 (10.2%) patients expired, with a mortality of 13.8%, 11.4%, 8.1%, 9.3%, and 8.6% in each year from 2010 to 2014 respectively. Higher case fatality was seen for corrosives and pesticides whereas plant poisons and drugs showed low case fatality (Table 3). 890 patients were reported or presumed from signs to have ingested cholinergic pesticides. The most identified were carbofuran (n=198, CF=17.3%), chlorpyrifos (n=74, CF=11%), quinalphos (n=24, CF=20.83%). 45 patients consumed organochlorine (CF=2.4%). Other identified pesticides included Paraquat (n=9, CF=100%), Dimethoate (n=4, CF=25%), Aluminium phosphide (n=3, CF 66.7%), Zinc phosphide (n=25, CF= 25%), Cypermethrin (n=63, CF 4.8%), Cyhalothrin (n=106, CF= 4.7%). The common plant poisons identified were Oduku (*Cleistanthus collinus*) leaves (n=381, CF = 6.33%) and oleander (*Thevetia peruviana*) seeds (n=287, CF =1.73%), Strichnin (n=6, CF= 33.3%), *Abrus precatorius* (n=62, CF=6.5%). Majority of death occurred in pesticide group than in non pesticide group (n=312, OR 4.06, 95% CI 3.16-5.23, p <0.0001). Mean duration of hospital stay was (4.6 ± 3.2 vs 3.6 ± 2) higher for pesticide exposure. Number of men were higher in pesticide group (n=1413, OR 3.2, 95% CI 2.8-3.7, p<0.0001). Among the pesticides, death was higher in cholinergic pesticide group than non cholinergic

pesticides (n=204, OR 2.8, 95% CI 2.2- 3.6, p<0.0001). Median duration of hospital stay was longer (5 vs 4) in cholinergic pesticide poisoning. Number of men were higher in cholinergic pesticide group (n=653, OR 1.3, 95% CI 1.1-1.6, p<0.0001). There is reduction in number of pesticide poisoning over the study period while there is minimal increase in plant and drug poisoning (figure 1).

DISCUSSION

There were more men than women in our study population in the age group 45 and above while there were more women below the age of 45 with girls outnumbering boys in adolescent age group. Women outnumbered men in poisoning with plants, petroleum products, and drugs while men dominated in the pesticide and corrosive poisoning. Women selected agents with low case fatality while men preferred those with higher case fatality. The agents were grouped into pesticides and non-pesticides for outcome analysis. The two groups showed significant difference in their survival and non-pesticide group showed better outcome. The pesticides are further divided into cholinergic and non-cholinergic groups and there was significant difference in outcome between the groups. Overall mortality in the study population was 10.2%. It is high when compared to a south Indian study from Vellore where it was 1.5% in a 3year retrospective analysis of deliberate self harm.¹¹ A higher case fatality ratio of 22.6% was observed in another south Indian retrospective study where only pesticide poisoning was included.¹² The difference of agents used for self harm in the two studies and the facilities of treatment in the two study settings may explain the wide variation in mortality. We have noted a decline in mortality over the 5 years. It parallels with the decline in suicide rate observed in the data of National crime records bureau from 2010 to 2014. We have noted a steady decline in number of pesticide poisoning, especially cholinergic pesticide cases admitted over these years. Reduction in cases with exposure to agents with higher CF like cholinergic pesticide might have resulted in lowering mortality. The number of cases which showed increase was plant toxins and drug exposure whose CF was comparatively lower. In China, decline in suicide mortality is observed in recent years because of reduced accessibility of pesticides due to rapid urbanisation and decline in agricultural practices.^{13,3} Cholinergic pesticides are the commonest single group of agents used for DSP in our study. Carbofuran which is an organocarbamate was the most identified single agent.

Organophosphorus compounds were observed as the common agents used for DSP and causes high mortality in other parts of India.^{14,15} Our study shows that CF of carbofuran which is a carbamate and classified as a WHO class Ib highly hazardous pesticide, is also very high. Oduku leaf poisoning is a common DSP seen in central Kerala especially among females probably because of its easy access.¹⁶ It is the commonest single agent identified in our study. There are small series of cases documented in literature mainly from south India, but larger series are not available.^{17,18} Probably the geographical location of Cleistanthus is the reason for larger number of cases in our study. It usually causes mild gastrointestinal disturbances, but hypokaemia, renal tubular acidosis, ARDS, neuromuscular blockade and arrhythmia are seen in fatal cases.^{19,20,21} It has a relatively higher CF compared to other plant toxin in our study. The Oleander seed poisoning is another common poisoning seen in south India and common agent observed in our study used by females. It has a relatively lower CF among the plant toxins in the study compared to strichnin and Abrus precatorius. Petroleum product especially kerosene which is used as cooking fuel is a common agent of ingestion for DSP among Indian women due to its easy accessibility. Chemical and aspiration pneumonitis are fatal complications noted in literature, but we didn't observe any fatality in our study.¹⁶ Poor outcome in pesticide group according to our study can be a pointer towards benefit of regulation of pesticide sales in reducing pesticide death as done in many countries. Banning of import of paraquat, dimethoate and fenthion in 2008 which were showing high case fatality in Srilanka have resulted in reduction of pesticide suicide mortality and overall suicide rates across the country.²² Banning WHO class1 highly hazardous pesticides in Bangladesh in the year 2000 showed a relative reduction of 37.1% in case fatality of pesticides and fewer pesticide suicide and fewer unnatural deaths in the post ban years without reducing the agricultural income of the country.²³ Banning highly fatal paraquat in South Korea resulted in decline in suicide mortality.²⁴

CONCLUSION

The Pesticides, especially cholinergic pesticides were the commonest group of agents used for deliberate self-poisoning in the study. Cleistanthus collinus and Thevetia peruviana were the common agents identified. Carbofuran was the commonest single agent identified among pesticides. Highest case fatality was seen for

Quinalphos, followed by Carbofuran, Chlorpyrifos and Cleistanthus. Exposure to pesticides, especially cholinergic pesticides by self poisoning were associated with significantly higher mortality than other agents. There was a reduction in overall mortality each year due to self-poisoning over the period of study with a reduction in pesticide related admissions in each year. Regulation of pesticide use should be considered while planning prevention strategies of suicide.

Limitations of the Study

Table 1: Age and gender wise distribution of study population.

Age Group	Male	Female
Adolescent (below 18)	77	242
Young (18 – 44 years)	1299	1195
Middle aged (45- 64years)	712	163
Elderly (65and above)	110	93

Table 2: Gender wise distribution of agents used for DSP.

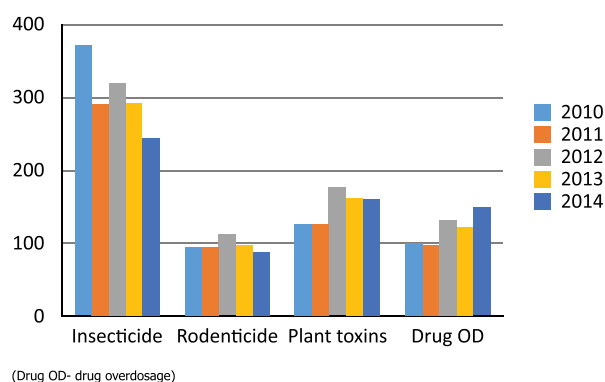
Agent	Male	Female
Plant poisons	336 (15.2%)	413 (24.4%)
Corrosives	54(2.4%)	37 (2.2%)
Pesticides	1413(63.8%)	598 (35.3%)
Miscellaneous	76(3.4%)	79(4.7%)
Petroleum products	77(3.4%)	107 (6.3%)
Drugs	188(8.5%)	415(24.5%)
Multiple agents	3(0.14%)	9(0.53%)
Unknown agents	67(3%)	35(2.1%)

Cofactors affecting survival unrelated to poisoning was not taken into account in our study. Name of the individual chemical was not documented in many records and rather the toxidromic approach was carried out. Chemical confirmation of poison was not done in any of the cases.

Table 3: Case fatality (CF) of agents used for DSP.

Agent	Survived	Expired	CF
Plant	713	36	5 %
Corrosives	76	15	19.7%
Pesticides (total)	1699	312	18.4%
Cholinergic pesticide	685	205	29.9%
Miscellaneous	148	7	4.7%
Petroleum products	184	0	0%
Drug	591	12	2.03%
Multiple	10	2	-
Unknown	92	10	-

Figure 1: Year-wise distribution of agents used for DSP during study



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