

Fatal Self-Poisoning with Insecticides – A Global Burden



Vijay Kumar AG¹, Vinay J^{2*}, Shivaramu MG³, Kumar U⁴ and Somshekar⁵

¹Associate Professor, Department of Forensic Medicine & Toxicology, Adichunchanagiri Institute of Medical Sciences, India

²Assistant Professor, Department of Forensic Medicine & Toxicology, Adichunchanagiri Institute of Medical Sciences, India

³Professor & Principal, Department of Forensic Medicine & Toxicology, Adichunchanagiri Institute of Medical Sciences, India

⁴Professor, Department of Forensic Medicine & Toxicology, Adichunchanagiri Institute of Medical Sciences, India

⁵Assistant Professor, Department of Forensic Medicine & Toxicology, Adichunchanagiri Institute of Medical Sciences, India

Submission: March 26, 2018; **Published:** April 24, 2019

***Corresponding author:** VINAY J, Assistant Professor, Department of Forensic Medicine & Toxicology, Adichunchanagiri Institute of Medical Sciences, Mandya, Karnataka State, India

Abstract

A pesticide poisoning occurs when chemicals intended to control a pest affect non-target organisms such as humans, wildlife, or bees. There are three types of pesticide poisoning. The first of the three is a single and short-term very high level of exposure which can be experienced by individuals who commit suicide, as well as pesticide formulators. In this retrospective study, all the cases with history of consumption of insecticides, that were autopsied from the date of 1st January 2015 to 31st December 2018 were analyzed at the department of Forensic Medicine and Toxicology, AIMS, Nagamangala taluq. Total number of autopsied cases due to insecticide consumption cases was 124 in four years. Maximum number of victims (33 cases) belongs 31-40 year age group followed by (32 cases) belongs to > 50 year age groups with male female ration is 2:1. Deliberate self-poisoning has become an increasingly common response to emotional distress in young adults, and it is now one of the most frequent reasons for emergency hospital admission. In industrialized countries, the drugs people commonly take in overdose analgesics, tranquilizers, antidepressants are relatively non-toxic. The estimated case fatality for overdose in England, for example, is around 0.5%. Most individuals who self-harm do not intend to die. Studies carried out in industrialized countries have found that only 2% go on to commit suicide in the subsequent 12 months. Furthermore, the importance of the problem indicates that in places where pesticide poisoning is frequent there is an urgent need to train primary health care personnel (including doctors and nursing staff at emergency care units) in the clinical management of such intoxications. Sadly, in many places where suicide attributable to pesticide ingestion is highly prevalent, health staff are neither aware of nor trained in appropriate procedures and do not have the necessary medication available when and where it is needed.

Keywords: Self-poisoning; Insecticides; Global burden

Introduction

A pesticide poisoning occurs when chemicals intended to control a pest affect non-target organisms such as humans, wildlife, or bees. There are three types of pesticide poisoning. The first of the three is a single and short-term very high level of exposure which can be experienced by individuals who commit suicide, as well as pesticide formulators. The second type of poisoning is long-term high-level exposure, which can occur in pesticide formulators and manufacturers. The third type of poisoning is a long-term low-level exposure, which individuals are exposed to from sources such as pesticide residues in food as well as contact with pesticide residues in the air, water, soil, sediment, food materials, plants and animals [1,2].

The organochlorine pesticides, like DDT, aldrin, and dieldrin, are extremely persistent and accumulate in fatty

tissue. Through the process of bioaccumulation, large amounts of organochlorines can accumulate in top species like humans. There is substantial evidence to suggest that DDT, and its metabolite DDE, act as endocrine disruptors, interfering with hormonal function of estrogen, testosterone, and other steroid hormones [3,4].

Acute pesticide poisoning is a large-scale problem, especially in developing countries. "Most estimates concerning the extent of acute pesticide poisoning have been based on data from hospital admissions which would include only the more serious cases. The latest estimate by a WHO task group indicates that there may be 1 million serious unintentional poisonings each year and in addition 2 million people hospitalized for suicide attempts with pesticides. This necessarily reflects only a fraction

of the real problem. On the basis of a survey of self-reported minor poisoning carried out in the Asian region, it is estimated that there could be as many as 25 million agricultural workers in the developing world suffering an episode of poisoning each year."

Materials and Methods

In this retrospective study, all the cases with history of consumption of insecticides, that were autopsied from the date of 1st January 2015 to 31st December 2018 were analyzed at the department of Forensic Medicine and Toxicology, AIMS, Nagamangala taluq.

Inclusion criteria

Autopsied cases of confirmed insecticide poisoning. (After confirmatory report of blood and visceral samples from Forensic science laboratory).

Exclusion criteria

Autopsied cases where history unknown.

Results

Tables 1-2

Table 1: Distribution of autopsied poisoning cases due to insecticide consumption.

Year	Total no. of poisoning cases
2015	28
2016	30
2017	34
2018	32
Total	124

Total number of autopsied cases due to insecticide consumption cases was 124 in four years.

Table 2: Age and sex-wise distribution of insecticide poisoning cases.

Age	Male	Female	Total
<20 years	0	01	01
21 – 30 years	16	12	28
31 – 40 years	23	10	33
41 – 50 years	22	08	30
>50 years	23	09	32
Total	84	40	124

Maximum number of victims (33 cases) belongs 31-40 year age group followed by (32 cases) belongs to > 50 year age groups with male female ration is 2:1.

Discussion

Total number of autopsied cases due to insecticide consumption cases was 124 in four years. Maximum number of victims (33 cases) belongs 31-40 year age group followed by (32 cases) belongs to > 50 year age groups with male female ration is 2:1. Deliberate self-poisoning has become an increasingly

common response to emotional distress in young adults, and it is now one of the most frequent reasons for emergency hospital admission. In industrialized countries, the drugs people commonly take in overdose analgesics, tranquillizers, antidepressants are relatively non-toxic. The estimated case fatality for overdose in England, for example, is around 0.5%. Most individuals who self-harm do not intend to die. Studies carried out in industrialized countries have found that only 2% go on to commit suicide in the subsequent 12 months.

The annual number of suicide attempts by pesticide ingestion between 2011 and 2014. We extracted demographic, clinical outcome, and pesticide class data from the medical records of 1,331 patients that attempted suicide by pesticide ingestion. Pesticides were sorted into 5 groups: herbicides, insecticides, fungicides, other pesticides, and combined pesticides. Each group was subdivided into various classes based on publications by the respective Resistance Action Committees. The chi-square test for trends was used to compare the annual incidence of categorical variables. The total number of suicide attempts decreased each year, from 399 in 2011 to 245 in 2014. Simultaneously, PQ ingestion decreased from 253 patients in 2011 to 60 in 2014. The proportion of PQ to pesticides also decreased from 63.4% in 2011 to 24.5% in 2014. Furthermore, the rate of decrease in the proportion of PQ to all herbicide categories increased by calendar year [5].

They identified data from 108 countries (102 from WHO data, 6 from the literature). A conservative estimate based on these data indicates that there were approximately 110,000 pesticide self-poisoning deaths each year from 2010 to 2014, comprising 13.7% of all global suicides. A sensitivity analysis accounting for under-reporting of suicides in India resulted in an increased estimate of 168,000 pesticide self-poisoning deaths annually, that is, 19.7% of global suicides. The proportion of suicides due to pesticide self-poisoning varies considerably between regions, from 0.9% in low- and middle-income countries in the European region to 48.3% in low- and middle-income countries in the Western Pacific region [6].

In contrast, the WHO estimated in 1990 that there are around 3 million hospital admissions for pesticide poisoning each year, 2 million of which are as a result of deliberate ingestion, and these result in around 220,000 deaths. The size of the problem is probably larger now – there have, for example, been well-recognised increases in pesticide poisonings in South Asia. The best evidence for estimating the global burden of suicide deaths from pesticide ingestion comes from China and South East Asia. In 2001 there were an estimated 517,000 suicides in developing countries in these regions and research evidence (see above) suggests pesticide ingestion accounts for over 60% of these suicides. We therefore estimate there are around 300,000 pesticide suicides each year in these regions alone. As pesticide suicides from other developing nations in Africa and South

America are not included in this figure the global toll is likely to be higher. The number of deaths caused by pesticides make Western concerns about these two methods of suicide appear somewhat trivial. For example, in Britain where paracetamol suicide is comparatively common, there are only around 200 paracetamol suicides per year (<4% of all suicides). If a similar proportion of suicides were due to paracetamol worldwide (an overestimate) then using the WHO's current estimate of 849,000 suicides worldwide each year a maximum of 34,000 of these might be attributable to paracetamol [7-10].

Conclusion

Furthermore, the importance of the problem indicates that in places where pesticide poisoning is frequent there is an urgent need to train primary health care personnel (including doctors and nursing staff at emergency care units) in the clinical management of such intoxications. Sadly, in many places where suicide attributable to pesticide ingestion is highly prevalent, health staff are neither aware of nor trained in appropriate procedures and do not have the necessary medication available when and where it is needed. In view of the magnitude of this problem, its impact and its relative neglect so far, three WHO departments (Mental Health and Substance Abuse, Injuries and Violence Prevention, and the Programme on the Promotion of Chemical Safety) recently joined forces to produce an action proposal entitled- The impact of pesticides on health: preventing intentional and unintentional deaths from pesticide poisoning. This initiative has already received strong support from civil society and some of the governments most directly concerned. It

is our hope that it will help to reduce the impact of pesticides on health and improve the performance of health systems.

References

1. Ramesh C Gupta (2011) Toxicology of Organophosphate & Carbamate Compounds. Academic Press pp. 352-353.
2. Denis Hamilton, Stephen Crossley (2004) Pesticide Residues in Food and Drinking Water: Human Exposure and Risks. John Wiley & Sons. Pp. 280.
3. Lewis A Owen, Kevin T Pickering (2006) An Introduction to Global Environmental Issues. Routledge. Pp. 197.
4. Annalee Yassi (2001) Basic Environmental Health. Oxford University Press. p. 277.
5. Lee JW, Hwang IW, Kim JW, Moon HJ, Kim KH, et al. (2015) Common Pesticides Used in Suicide Attempts Following the 2012 Paraquat Ban in Korea. *J Korean Med Sci* 30(10): 1517-1521.
6. Mew EJ, Padmanathan P, Konradsen F, Eddleston M, Chang SS, et al. (2017) The global burden of fatal self-poisoning with pesticides 2006-15: Systematic review. *J Affect Disord* 219: 93-104.
7. Gunnell D, Murray V, Hawton K (2000) Use of paracetamol (acetaminophen) for suicide and nonfatal poisoning: worldwide patterns of use and misuse. *Suicide Life Threat Behav* 30(4): 313-326.
8. Hawton K, Townsend E, Deeks J, Appleby L, Gunnell D, et al. (2001) Effects of legislation restricting pack sizes of paracetamol and salicylate on self-poisoning in the United Kingdom: before and after study. *BMJ* 322(7296): 1203-1207.
9. Jeyaratnam J (1990) Acute pesticide poisoning: a major global health problem. *World Health Stat Q* 43(3): 139-144.
10. WHO (2002) The World Health Report 2002: Reducing Risks, Promoting Healthy Life. WHO, Geneva, Switzerland.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/JFSCI.2019.11.555821](https://doi.org/10.19080/JFSCI.2019.11.555821)

Your next submission with Juniper Publishers will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
(Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission

<https://juniperpublishers.com/online-submission.php>