Issue of Intentional Pesticide Poisoning on A Global Scale

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Pesticide is generally defined as a chemical or biological agent which is used to combat pests such as weeds, molluscs, insects, plant pathogens, nematodes, microbes, and weeds that damage food, have a tendency to spread or act as a vector for disease, or are just an annoyance. Elemental sulfur dust, which was used in Sumeria about 4,500 years ago, was likely the first known pesticide. However, over the past few decades, agricultural highly hazardous pesticides (HHPs), have become more prevalent in rural regions of developing countries. Unfortunately, because these pesticides are easily accessible, people who try to poison themselves often choose to use them. Pesticide-induced self-poisoning is responsible for around 14-20% of suicides worldwide, resulting in an estimated annual fatality rate of 318,000-360,000 individuals. Surprisingly, China alone accounts for more than 50% of these fatalities annually. In another case of Sri Lanka, pesticide poisoning was recognized as the leading cause of mortality in government hospitals, surpassing all other causes. According to studies in 2016, the suicide rate in India among women is the fourth greatest globally, whereas it ranks 62nd among men. As of October 2019, India had registered a total of 318 pesticides for usage. Among these, 18 were classified as extremely hazardous (Class Ia) or highly hazardous (Class Ib) based on the toxicity criteria established by the World Health Organization. Compared to other drugs that people often use to harm themselves, like analgesics and sedatives, HHPs have a high case fatality rate. There were probably a lot more cases than that because many cases are still not recorded. It was further estimated that 30 million people were acutely poisoned by pesticides at work every year, but most of those cases were not reported because the people who were poisoned did not go to the hospital. In the three decades following the publication by the WHOs, few limited-scale surveys on pesticide poisoning have been documented. However, there is currently a lack of contemporary assessments about the prevalence of pesticide poisoning on a worldwide scale. In order to prevent the unneeded loss of life, it is imperative to employ efficacious strategies aimed at diminishing the occurrence of pesticide poisoning episodes in developing nations. This is mostly the responsibility of developing countries, especially those in the Asia-Pacific area, where about 95% of deadly pesticide accidents happen.

Most of the deaths are caused by organophosphates, organochlorines, and aluminum phosphide. The inhibition of AChE by organophosphate chemicals leads development of intermediate syndrome and respiratory paralysis followed by death. While, organochlorine pesticides have been found to be highly toxic to the central nervous system and have the ability to sensitize the myocardium to catecholamines. Severe inflammation of the pharynx, corrosive damage to the gastrointestinal tract, necrosis of the renal tubules, necrosis of the liver, and pulmonary fibrosis result from paraquat ingestion. Rodenticides encompass several chemical compounds, such as thallium, barium carbonate, superwarfarins, and phosphides, specifically aluminum and zinc phosphide. Alopecia is an unconventional characteristic observed in cases of thallium toxicity. While the vast majority of superwarfarin exposures are non-fatal, protracted hemorrhage is possible. Ingestion of barium carbonate can result in profound hypokalemia and impairment of the respiratory muscles. Aluminium phosphide is a potent poisonous substance associated with a death rate that varies between 37% and 100%. This substance hinders the activity of mitochondrial cytochrome c oxidase, resulting in adverse effects on the respiratory and cardiac systems. Pyrethroids and insect repellents, such as diethyltoluamide, are generally considered to have low toxicity; yet, they have the potential to induce harmful effects on the pulmonary and central nervous systems. Ethylene dibromide, a potent fumigant pesticide, is known to cause severe oral ulcerations, followed by liver and renal toxicity, and has a high fatality rate.

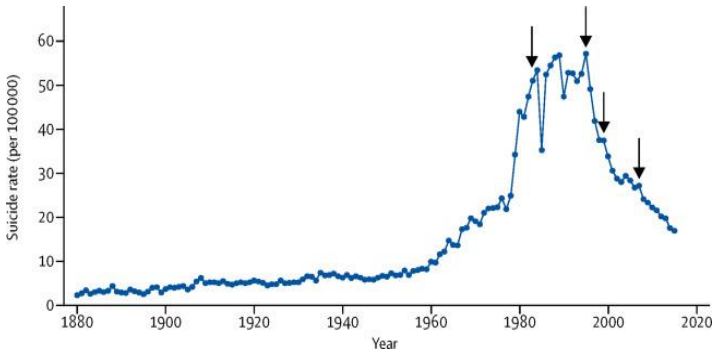

Fig. 1 Data of suicide in Sri Lanka during 1880–2015.

Precautionary measures or recommendations to be implemented

- Medical management: It is imperative to provide extensive education to physicians practicing in remote and rural areas regarding early diagnosis and appropriate management strategies, including the utilization of supportive care and antidotes, when accessible. For example, ensuring proper skin decontamination is crucial, as it helps prevent any potential secondary contamination of healthcare personnel.
- Restriction of HPPs: Restricting access to prevalent, extremely lethal pesticides is among the most effective strategies for preventing suicide. The implementation of national bans on HHPs in various countries has resulted in significant decreases in both pesticide-related suicides and overall suicide rates, particularly in cases where pesticide self-poisoning is a prevalent method of suicide, Srilanka and Bangladesh are the best examples who implemented this strategy as shown in Fig.1. Significant reduction in number of suicides after banning of several HPPs clearly indicate the importance of this strategy.
- Legislative: National regulatory actions should be taken to review the use of pesticides in agricultural activities. HHPs should be replaced with new chemicals but only after the proper testing. The registration of pesticides could be subject to periodic reviews, and its validity could be limited to no more than five years. Implementing a heightened level of caution when registering new pesticides, including the potential toxicity associated with self-inflicted harm as well as accidental exposure, would diminish the likelihood of substituted pesticides that are just as lethal as those that have been prohibited.
- Sustainable management practices: Enhancing understanding and promoting consciousness on pesticide-related matters. Promoting sustainable and organic practices in agriculture, trying to minimize the usage of pesticides.

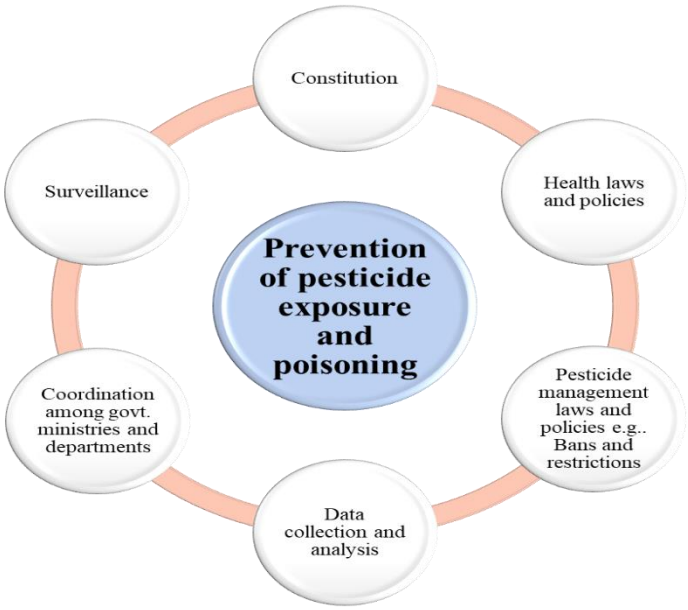

Fig. 2 Multiple approaches or strategies towards prevention of intentional pesticide poisoning

In conclusion, a combination of enhanced medical management, improved community use of pesticides, and government regulation to remove HHPs from agricultural practice will be necessary to prevent pesticide suicide. The implementation of aggressive resuscitation techniques and the timely administration of available antidotes are crucial factors in mitigating mortality rates. Also, numerous scholars emphasize the necessity for further investigation to ascertain the efficacy and feasibility of various approaches aimed at preventing suicides through pesticide poisoning.

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