

Acute pesticide poisoning – a global public health problem

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ABSTRACT

Acute pesticide poisoning has become a major public health problem worldwide, following the intensification of agriculture and the promotion of agrochemicals in low and middle income countries, with more than 300,000 deaths each year. The easy availability of highly toxic pesticides in the homes of farming communities has made pesticides the preferred means of suicide with an extremely high case fatality. Similarly, the extensive use of pesticides exposes the community to both long-term and acute occupational health problems. A concerted effort is urgently needed to address the situation.

The World Health Organization (WHO) estimate that at global level three million severe pesticide poisoning episodes occur annually and, of these, a minimum of 300,000 die with 99% of the cases being from low and middle income countries [1]. Currently there are no precise estimates of the health impacts resulting from longer-term exposure to pesticides. The need to ensure local agricultural production and food security in low and middle income countries and simultaneously protect the population against the health impacts following exposure to pesticides have emerged as a major global public health challenges.

PESTICIDES, AGRICULTURE AND HEALTH IMPACTS

As a consequence of the increasing focus in most low and middle income countries on intensification, commercialization and globalization of the agricultural sector, the use of pesticides has become widespread even among the smallest producers, including the use of plant protection chemicals against insects and weeds, and has become a billion dollar business with many national and international agents.

Research, conducted primarily in industrialized countries, has emphasized the health consequences of exposure to pesticides, including reproductive health impacts and the occurrence of cancer. Following the debate on the effects of pesticide use political initiatives have been taken in the West to counter these health impacts [2]. At a global level much attention has been paid to the occupational impacts of pesticide use and this has resulted in very few cases of severe poisonings in, for example, the agricultural and horticultural sector in Denmark. However, in many low and middle income countries the problems associated with occupational related pesticide poisoning are still significant. Although it has been known for a long time that the majority of deaths from pesticide poisoning follows acts of self-poisoning it is only recently that this issue gained attention at an international level.

Studies from Asia have documented that self-poisoning with pesticides is one of the most predominant means of suicide. For example, in China, Sri Lanka and Malaysia more than 60% of all suicides in rural areas are from pesticide poisoning [1]. Also, a large proportion of the beds in intensive care units are taken up by poisoning cases.

The problem of self-poisoning with pesticides is now so severe that it accounts for 50%-75% of all deaths among young women in the 10-19 year age groups in south India [3], and 14% of all deaths among women in Bangladesh in the 10-50 year age group [4]. In Sri Lanka, studies have shown that there are more than 160 hospital admissions for severe pesticide poisoning per 100,000 inhabitants per year [5]. Although acute pesticide poisoning is still not as pronounced in Africa as in Asia it is a growing problem and the increasing intensification of agricultural production in Africa and a more widespread use of pesticides will result in an increased number of pesticide poisoning cases [6].

The very high proportion of all suicides associated with the deliberate intake of pesticides is a result of the very high case fatality associated with the exposure to the extremely toxic chemicals available in the markets in many low and middle income countries. In Asia, the case fatality after self-poisoning with pesticides is 10% to 20% and for some WHO class I and II pesticides, for example the herbicide Paraquat, the case-fatality is as high as 70% [7]. In comparison the case-fatality in England following suicide attempts with medicine is 0.5% [1].

The many impulsive acts of self-harm that result in death in rural Asia can, to a large extent, be explained by the easy access to pesticides in the homes. Individuals at high risk for self-poisoning can be found in socio-economically deprived households, especially in families where domestic violence and alcohol addiction are major problems. However, self-poisoning also does occur in better off and well functioning families where a small fight among siblings, poor school performance or a failed love affair may have tragic consequences [8]. No evidence exists to indicate that individuals that self-harm deliberately choose pesticides above other means of suicide because they have an especially high wish to die. Studies in Asia indicate that the individuals choose the means that is most easily accessible and in this way the debate about access to pesticides is not much different from that ongoing in USA and in Western Europe about access to small arms in the homes and the storage and marketing of medicine.

There is no evidence to suggest that a complete removal of pesticides from the home would result in a dramatic decline in the incidence of suicide attempts, as alternative means of suicide would be available and the underlying and often complex problems faced by individuals would remain unsolved. However, most importantly, the mortality from suicide attempts would be reduced significantly following the removal of the most toxic pesticides and provide opportunities for family members, health authorities or private organizations to support the individuals before it is too late.

A review of existing information indicates that the most important policy change to reduce mortality from acute pesticide poisoning would be to phase out the most toxic chemicals, namely the WHO class I and II pesticides, and substitute these with less toxic groups of pesticides. Evidence shows that if such a policy of removing the most toxic pesticides is in place and properly enforced it will result in a reduced number of deaths from acute poisoning [9]. Also, it is important to promote at community level ways to store pesticides out of easy reach and further field based projects are needed to develop appropriate strategies for this. International chemical companies are investing resources aimed at the development of formulations of specific pesticides with less acute toxic effect but the results of these efforts are still not available.

The overall aim of agricultural policies must be to reduce the use of pesticides to the lowest level feasible. This will require large investments in, for example, integrated pest management programs aimed at reducing the need for pesticides through alternative means of plant protection. A reduction in the overall use of pesticides will not only reduce the number of deaths following suicide attempts but will also have a positive effect on the number of accidental poisonings in the homes, reduce the number of occupational related poisonings and minimize the overall exposure to pesticides at com-

munity level. To promote farming systems with less use of pesticides there is a need for increased national and international focus and debate about the benefits of food products and other agricultural products produced with a minimum input of pesticides. Similarly, there is a need to include human health concerns more directly in the international aid provided to the agricultural sector in low and middle income countries.

In many countries in Asia, Africa and Latin America the health system lacks the capacity to manage the many cases of acute poisoning and the services are in need for more antidotes, respirators, better trained staff, more ambulances etc. Likewise, the case management gets complicated by the hundreds of different chemical compounds used as pesticides and the thousands of different brand names marketed. The case management is further constrained by the lack of evidence based guidelines for case management. For example, it is clear from recent research that more than 100 common types of pesticides in the group of organophosphates can not be treated in the same way as they respond differently to, for example, oximes and generally result in different clinical manifestations. This makes it necessary to produce specific treatment protocols for the different chemicals. An increased investment in the national health care service would contribute to a reduced mortality from acute poisoning and could be a very worthwhile investment in a scenario where the most toxic pesticides are replaced with less harmful products. In this way it will also increase the likelihood that the patient will make it to hospital alive and with an increased chance that the treatment will have a positive result.

Although studies from Asia show that only a small proportion of individuals that self-harm with pesticides suffer from mental illnesses, an increased investment in psychiatric services and psychosocial support programs may contribute to the prevention of self-harm episodes and could provide support for the individuals surviving suicide attempts. In low-income societies only few such programs are in place to prevent suicide or provide support to individuals suffering from mental illnesses and these are most often managed by private non-profit organizations without much support from the government. Interestingly, Sri Lanka is one of the few countries in the Asian region with a national plan aimed at preventing suicide. This plan includes laws to phase out the most toxic pesticides, do away with policies that regard suicide and suicide attempts punishable by law and encourage the establishment of local support centers and life skills programs in schools [10]. Although the Sri Lankan government aims at improving the psychiatric treatment facilities this sector is still very weak and not very different from the low capacity seen in other low and middle income regions with an average of 0.44 and 0.34 professional staff per 100.000 individuals in Asia and Africa, respectively.

CONCLUSION

The easy access to extremely toxic pesticides in the homes of the rural population throughout many low and middle income countries has made self-poisoning with pesticides the most common means of suicide with a very high case-fatality. Similarly, the widespread exposure to pesticides, especially in the occupational environment, results in short and long-term health impacts. A number of policies and interventions have been identified to reduce the number of poisoning episodes. However, action at both the national and international level is needed to reduce pesticide poisoning as a global public health problem.

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References

1. Gunnell D, Eddleston M. Suicide by intentional ingestion of pesticides: a continuing tragedy in developing countries. *Int J Epidemiol* 2003;32:902-9.
2. Alavanja MC, Hoppin JA, Kamel F. Health effects of chronic pesticide exposure: cancer and neurotoxicity. *Annu Rev Public Health*. 2004;25:155-97.
3. Aaron R, Joseph A, Abraham S, et al. Suicide in young people in rural southern India. *Lancet* 2004;363:1117-8.
4. Yusuf HR, Akhter H, Rahman MH, et al. Injury-related deaths amongst women aged 10-50 years in Bangladesh, 1996-97. *Lancet* 2000;355:1220-1224.
5. van der Hoek W, Konradsen F. Risk factors for acute pesticide poisoning in Sri Lanka. *Trop Med Int Health* 2005;10:589-96.
6. London L, Flisher AJ, Wesseling C, et al. Suicide and exposure to organophosphate insecticides: cause or effect? *Am J Ind Med* 2005;47:308-21.
7. Eddleston M, Karalliedde L, Buckley N, et al. Pesticide poisoning in the developing world--a minimum pesticides list. *Lancet* 2002;360:1163-7.
8. Konradsen F, Hoek WV, Peiris P. Reaching for the bottle of pesticide – a cry for help. Self-inflicted poisonings in Sri Lanka. *Soc Sci Med*; 62:1710-9.
9. Konradsen F, van der Hoek W, Cole DC, et al. Reducing acute poisoning in developing countries – options for restricting the availability of pesticides. *Toxicology* 2003;192:249-61.
10. Vijayakumar L, Pirkis J, Whiteford H. Suicide in developing countries (3). *Crisis* 2005;26:120-124.