Relative toxicity of pesticides in the developing world

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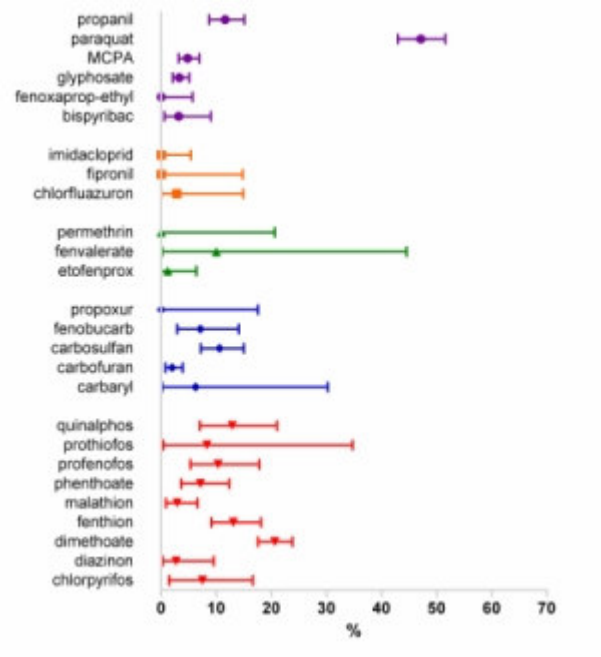
Objective: The clinical impact of pesticide poisoning is a function of both the intrinsic toxicity of the pesticide and the resources that a country has to treat the poisoning. Effective pesticide regulation can be threatened by illegal importation and has to take into account agricultural and economic outcomes. The effects of effective regulation have been evident in Sri Lanka where targeted pesticide restrictions have led to a reduction in pesticide death without decreased agricultural production. Our aim is to provide information about the relative toxicity of pesticides that could inform regulatory policy and may assist in the development of a minimum pesticide list. Methods: We examined the case fatality for patients presenting following pesticide ingestion. Data was prospectively collected from a cohort of consecutive patients from April 2002 to April 2007. Identification of pesticides was based on history or positive identification of the container and plasma assays in some cases. Results: There were 6449 patients who ingested a pesticide and were analysed. Sixty percent of all patients, and over 90% of organophosphate admissions had plasma assayed for pesticides and confirmed the history in over 90% patients. The case fatality for commonly ingested pesticides is presented in figure 1. Analysis of the data suggests that if paraquat was removed from the market it would lead to a 30% reduction in deaths after adjusting for increased ingestion of other herbicides. Similarly removal of dimethoate would reduce overall mortalaity by 12%. Extrapolation of this data to the national figures of 3000 deaths per year from pesticides suggests a reduction in deaths of about 1200 per year. Discussion: There may be an underestimation of benefit of dimethoate restriction as establishment of clinical research units has been shown to reduce mortality in the past. Mortality from paraquat is likely to be a robust estimate as there is no treatment which clearly alters outcome. It is clear that within a class of pesticides there is a significant range of fatal toxicity. The usefulness of point estimates of zero fatalities which have wide confidence intervals could be enhanced by including other more sensitive clinical markers of toxicity based on animal toxicity data and known mechanisms of action. This data can inform a restricted pesticide policy that operates within the constraints of local health systems. A cost-minimization approach could be explored, using models similar to those developed for drug regulation and subsidy. Conclusion: We have sufficient information to iteratively develop a minimum pesticide list. Such implementation will require continuous sentinel monitoring of usage and clinical presentations.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