IASP Special Interest Group (SIG) on the Prevention of Intentional Pesticide Poisoning

Bibliography: Topic - Prevention

BACKGROUND: To study clinical aspects of the oral paraquat intoxication and to assess the effectiveness of both the charcoal haemoperfusion and the so-called "Caribbean scheme" (cyclophosphamide, dexamethasone, furosemide and vitamins B and C) to reduce its mortality. PATIENTS AND METHOD: Retrospective study of 29 consecutive cases admitted to our intensive care unit in 17 years. RESULTS: a) Twenty five men and four women ingested 20% paraquat solution, either accidentally (4 subjects) or deliberately (25 subjects). The suicidal purpose was particularly strong among men aged 50-66 years. Most of patients had vomits and diarrhoea. All patients developed oral and pharyngeal caustic lesions. Hypokalaemia was detected on admission in 9 patients. Increased levels of serum aminotransferases, bilirubin, amylase or creatinkinase were detected in some patients. Twenty two patients developed acute renal failure and 18 patients respiratory failure. Twenty patients died (ten in the first 48 hours and ten between days 3 and 30); b) charcoal haemoperfusion was performed on 16 patients; 4 of the 16 treated patients survived, versus 5 of the 13 non treated (p = NS), and c) the "Caribbean scheme" was applied on 18 patients. All but one of the 11 subjects who ingested >= 45 ml (treated with the "Caribbean scheme" or not) died. Among those who ingested 45 ml, 8 of the 12 treated patients survived, versus none of the 6 non treated ones (p < 0.05). CONCLUSIONS: Charcoal haemoperfusion did not reduce mortality of paraquat. The "Caribbean scheme" was associated with a lesser mortality in the subjects who ingested 45 ml of 20% paraquat solution.


64 patients admitted to Kandy General Hospital, Sri Lanka, following 'self-poisoning' were interviewed. The sample resembled those from Western countries in that a major cause was inter-personal disputes, but differed from the West in that the disputes were mainly between patient and kin. Other differences were that social isolation was not a cause, agricultural pesticides were the commonest poisons used, relatively few patients were referred for psychiatric advice, and recidivism was very infrequent. An attempt is made to explain the differences on a socio-cultural basis.


OBJECTIVE: Pesticide self-poisoning accounts for one-third of suicides worldwide, but few studies have investigated the national epidemiology of pesticide suicide in countries where it is a commonly used method. We investigated trends in pesticide suicide, and factors associated with such trends, in Taiwan, a rapidly developing East Asian country. METHODS: We conducted an ecological study using graphical approaches and Spearman's correlation coefficients to examine trends in pesticide suicide (1987-2010) in Taiwan in relation to pesticide sales, bans on selected pesticides, the proportion of the workforce involved in agriculture and unemployment. We
compared pesticide products banned by the Taiwanese government with products that remained on the market and pesticides that accounted for the most poisoning deaths in Taiwan. RESULTS: Age-standardised rates of pesticide suicide showed a 67% reduction from 7.7 per 100,000 (42% of all suicides) in 1987 to 2.5 per 100,000 (12% of all suicides) in 2010, in contrast to a 69% increase in suicide rates by other methods. Pesticide poisoning was the most commonly used method of suicide in 1987 but had become the third most common method by 2010. The reduction was paralleled by a 66% fall in the workforce involved in agriculture but there was no strong evidence for its association with trends in pesticide sales, bans on selected pesticide products or unemployment. The bans mostly post-dated the decline in pesticide suicides; furthermore, they did not include products (e.g. paraquat) that accounted for most deaths and were mainly restricted to selected high-strength formulated products whilst their equivalent low-strength products were not banned. CONCLUSIONS: Access to pesticides, indicated by the size of agricultural workforce, appears to influence trends in pesticide suicide in Taiwan. Targeted bans on pesticides should focus on those products that account for most deaths.


Deliberate self-harm is a major public health problem. This study is aimed to examine the sociodemographic characteristics of both non-fatal and fatal deliberate self-harm cases admitted at the 13 block primary health centres of the Sundarbans region under South 24 Parganas district, West Bengal. Retrospective deliberate self-harm data from the admission registers of 13 block primary health centres was collected for the year 1999. A total of 1850 deliberate self-harm cases (639 males and 1211 females) were admitted at the 13 block primary health centres, of which 159 (60 males, 99 females) were fatal (completed suicide). A higher fatality rate for male than female (9.4% compared to 8.2%) was observed. Women (65.5%), especially of younger age groups constituted the major cases. Poisoning (96.9%) was the commonest method of self-harm. Easy availability of pesticides was a common factor. Marital status and seasonal trend (March-April) had important contribution in self-harm incidents. Planned psychosocial intervention as a part of community mental health programme may help to reduce the deliberate self-harm morbidity and mortality at this primary care level.


Objectives: The study aims to determine the incidence of suicide attempt, describe the methods used, and assess use of health care services including mental health care after suicide attempt in a rural area of Vietnam. Methods: All suicide attempters (104) during 2003-2007 were listed, diagnosed and
re-evaluated by trained physicians according to the research criteria of the
WHO Multicentre Study of Attempted Suicide. All attempters were
interviewed by trained medical staff to investigate methods used,
socio-demographic characteristics and use of health services. Results: The
yearly incidence was 10.2 per 100000 person-years, 10.6 per 100000 in
males and 9.8 per 100000 in females. 99% of cases committed suicide
attempt by poisoning, 62.6% by pesticides and 36.3% by pharmaceutical
drugs. 34.3% reported having been in contact with somatic care and 13.2%
had received mental health care. Among those who reported some treatment
received, 47.5% had been in contact with official health care services, 8.1%
had pharmacy keepers' consultation or were treated by traditional healers
and 4% reported self treatment. Conclusion: The incidence of suicide attempt
was lower in this population compared to other settings. While the majority of
attempters use pesticides, many had used psychotropic drugs. Contact with
mental health services following the attempt was very limited in this setting.
Suicide prevention for this high risk group should focus on reducing access
to pesticides and psychotropic drugs. Mental health services should be made
more accessible in rural areas. 2010 Nguyen et al; licensee BioMed Central
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Asia--preventing deaths from organophosphorus pesticide and yellow oleander
Self-poisoning with pesticides or plants is a major clinical problem in rural
Asia, killing several hundred thousand people every year. Over the last 17
years, our clinical toxicology and pharmacology group has carried out clinical
studies in the North Central Province of Sri Lanka to improve treatment and
reduce deaths. Studies have looked at the effectiveness of anti-digoxin Fab
in cardiac glycoside plant poisoning, multiple dose activated charcoal in all
poisoning, and pralidoxime in moderate toxicity organophosphorus
insecticide poisoning. More recently, using a Haddon matrix as a guide, we
have started conducting public health and animal studies to find strategies
that may work outside of the hospital. Based on the 2009 GSK Research in
Clinical Pharmacology prize lecture, this review shows the evolution of the
group’s research from a clinical pharmacology approach to one that studies
possible interventions at multiple levels, including the patient, the community
and government legislation.

organophosphorus insecticides on pesticide poisoning hospital admissions." Clin
Toxicol (Phila) 50(3): 202-209.
BACKGROUND: Pesticide self-poisoning causes one third of global suicides.
Sri Lanka halved its suicide rate by banning WHO Class I organophosphorus
(OP) insecticides and then endosulfan. However, poisoning with Class II
toxicity OPs, particularly dimethoate and fenthion, remains a problem. We
aimed to determine the effect and feasibility of a ban of the two insecticides
in one Sri Lankan district. METHODS: Sale was banned in June 2003 in
most of Polonnaruwa District, but not Anuradhapura District. Admissions with
pesticide poisoning to the district general hospitals was prospectively
recorded from 2002. RESULTS: Hospital admissions for dimethoate and
fenthion poisoning fell by 43% after the ban in Polonnaruwa, while increasing by 23% in Anuradhapura. The pesticide case fatality fell from 14.4% to 9.0% in Polonnaruwa (odds ratio [OR] 0.59, 95% confidence interval [CI] 0.41-0.84) and 11.3% to 10.6% in Anuradhapura (OR 0.93, 95% CI 0.70-1.25; p = 0.051). This reduction was not sustained, with case fatality in Polonnaruwa rising to 12.1% in 2006-2007. Further data analysis indicated that the fall in case fatality had actually been due to a coincidental reduction in case fatality for pesticide poisoning overall, in particular for paraquat poisoning. CONCLUSIONS: We found that the insecticides could be effectively banned from agricultural practice, as shown by the fall in hospital admissions, with few negative consequences. However, the ban had only a minor effect on pesticide poisoning deaths because it was too narrow. A study assessing the agricultural and health effects of a more comprehensive ban of highly toxic pesticides is necessary to determine the balance between increased costs of agriculture and reduced health care costs and fewer deaths.

Eddleston, M., N. A. Buckley, et al. (2006). "Identification of strategies to prevent death after pesticide self-poisoning using a Haddon matrix." Inj Prev 12(5): 333-337. Despite pesticide self-poisoning causing around 300 000 deaths each year in the rural Asia Pacific region, no comprehensive public health response has yet been formulated. The authors have developed a Haddon matrix to identify factors that increase the risk of fatal rather than non-fatal pesticide self-poisoning in Sri Lanka. Many important host factors such as age, gender, and genetics are not alterable; factors that could be changed-alcohol use and mental health-have previously proved difficult to change. Interventions affecting agent or environmental factors may be easier to implement and more effective, in particular those limiting the human toxicity and accessibility of the pesticides, and the quality, affordability, and accessibility of health care in the community. Controlled studies are required to identify effective strategies for prevention and harm minimization and to garner political support for making the changes necessary to reduce this waste of life. Lessons learnt from Sri Lanka are likely to be highly relevant for much of rural Asia.


BACKGROUND: Although more than 100 organophosphorus insecticides exist, organophosphorus poisoning is usually regarded as a single entity, distinguished only by the compound's lethal dose in animals. We aimed to determine whether the three most common organophosphorus insecticides used for self-poisoning in Sri Lanka differ in the clinical features and severity of poisoning they cause. METHODS: We prospectively studied 802 patients with chlorpyrifos, dimethoate, or fenthion self-poisoning admitted to three hospitals. Blood cholinesterase activity and insecticide concentration were measured to determine the compound and the patients' response to insecticide and therapy. We recorded clinical outcomes for each patient. FINDINGS: Compared with chlorpyrifos (35 of 439, 8.0%), the proportion dying was significantly higher with dimethoate (61 of 264, 23.1%, odds ratio
[OR] 3.5, 95% CI 2.2-5.4) or fenthion (16 of 99, 16.2%, OR 2.2, 1.2-4.2), as was the proportion requiring endotracheal intubation (66 of 439 for chlorpyrifos, 15.0%; 93 of 264 for dimethoate, 35.2%, OR 3.1, 2.1-4.4; 31 of 99 for fenthion, 31.3%, 2.6, 1.6-4.2). Dimethoate-poisoned patients died sooner than those ingesting other pesticides and often from hypotensive shock. Fenthion poisoning initially caused few symptoms but many patients subsequently required intubation. Acetylcholinesterase inhibited by fenthion or dimethoate responded poorly to pralidoxime treatment compared with chlorpyrifos-inhibited acetylcholinesterase. INTERPRETATION: Organophosphorus insecticide poisoning is not a single entity, with substantial variability in clinical course, response to oximes, and outcome. Animal toxicity does not predict human toxicity since, although chlorpyrifos is generally the most toxic in rats, it is least toxic in people. Each organophosphorus insecticide should be considered as an individual poison and, consequently, patients might benefit from management protocols developed for particular organophosphorus insecticides.


In parts of the developing world, pesticide poisoning causes more deaths than infectious diseases. Use of pesticides is poorly regulated and often dangerous; their easy availability also makes them a popular method of self-harm. In 1985, the UN Food and Agriculture Organisation (FAO) produced a voluntary code of conduct for the pesticide industry in an attempt to limit the harmful effects of pesticides. Unfortunately, a lack of adequate government resources in the developing world makes this code ineffective, and thousands of deaths continue today. WHO has recommended that access to highly toxic pesticides be restricted--where this has been done, suicide rates have fallen. Since an Essential Drugs List was established in 1977, use of a few essential drugs has rationalised drug use in many regions. An analogous Minimum Pesticides List would identify a restricted number of less dangerous pesticides to do specific tasks within an integrated pest management system. Use of safer pesticides should result in fewer deaths, just as the change from barbiturates to benzodiazepines has reduced the number of deaths from pharmaceutical self-poisoning.


BACKGROUND: Road traffic crashes are considered by the WHO to be the most important global cause of death from injury. However, this may not be true for large areas of rural Asia where road vehicles are uncommon. The issue is important, since emphasising the importance of road traffic crashes risks switching resources to urban areas, away from already underfunded rural regions. In this study, we compared the importance of road traffic crashes with other forms of injury in a poor rural region of South Asia. METHODOLOGY/PRINCIPAL FINDINGS: We collected data on all deaths from injury in the North Central Province of Sri Lanka (NCP; population 1,105,198 at 2001 census) over 18 months using coronial, hospital, and police data. We calculated the incidence of death from all forms of intentional and unintentional injury in the province. The annual incidence of death from
injury in the province was high: 84.2 per 100,000 population. Half of the
dead were from self-harm (41.3/100,000). Poisoning (35.7/100,000)—in
particular, pesticide self-poisoning (23.7/100,000)—was the most common
cause of death, being 3.9-fold more common than road traffic crashes (9.1
100,000). CONCLUSIONS/SIGNIFICANCE: In poor rural regions of South
Asia, fatal self-harm and pesticide self-poisoning in particular are significantly
more important than road traffic injuries as a cause of death. It is possible
that the data used by the WHO to calculate global injury estimates are
biased towards urban areas with better data collection but little pesticide
poisoning. More studies are required to inform a debate about the
importance of different forms of injury and how avoidable deaths from any
cause can be prevented. In the meantime, marked improvements in the
effectiveness of therapy for pesticide poisoning, safer storage, reduced
pesticide use, or reductions in pesticide toxicity are required urgently to
reduce the number of deaths from self-poisoning in rural Asia.

Gunnell, D. and M. Eddleston (2003). "Suicide by intentional ingestion of pesticides:

BACKGROUND: Between 1950 and 1995 suicide rates in Sri Lanka
increased 8-fold to a peak of 47 per 100,000 in 1995. By 2005, rates had
halved. We investigated whether Sri Lanka's regulatory controls on the
import and sale of pesticides that are particularly toxic to humans were
responsible for these changes in the incidence of suicide. METHODS:
Ecological analysis using graphical and descriptive approaches to identify
RESULTS: Restrictions on the import and sales of WHO Class I toxicity
pesticides in 1995 and endosulfan in 1998, coincided with reductions in
suicide in both men and women of all ages. 19,769 fewer suicides occurred
in 1996-2005 as compared with 1986-95. Secular trends in unemployment,
alcohol misuse, divorce, pesticide use and the years associated with Sri
Lanka's Civil war did not appear to be associated with these declines.
CONCLUSION: These data indicate that in countries where pesticides are
commonly used in acts of self-poisoning, import controls on the most toxic
pesticides may have a favourable impact on suicide. In Asia, there are an
estimated 300,000 deaths from pesticide self-poisoning annually. National
and international policies restricting the sale of pesticides that are most toxic
to humans may have a major impact on suicides in the region.

Gunnell, D. and G. Lewis (2005). "Studying suicide from the life course perspective:
Suicide is an important contributor to premature mortality accounting for over
800 000 deaths worldwide every year. Environmental and genetic factors
acting from before birth to old age affect an individual's risk of suicide. Risk is
influenced not only by psychiatric illness and impulsive behaviour but also by
factors such as the cultural acceptability of suicide, the ease of availability
of lethal suicide methods, help-seeking behaviours in times of crisis and access
to effective treatments following self-harm. Suicide prevention programmes
might usefully focus on two discrete areas: the prevention of the psychiatric illnesses that precede suicide and tackling those risk factors particular to suicide such as media influences, help-seeking, the availability of methods and the medical management of self-harm.


BACKGROUND: Self-poisoning with pesticides is a major reason for high suicide rates in rural areas of many developing countries. Safer storage of pesticides may be one means of prevention. We have conducted a study to assess the acceptability and use of lockable boxes for storing pesticides in rural Sri Lanka. METHODS: Four hundred lockable metal storage boxes were given to farming households, 100 in each of four villages. Assessment interviews were conducted by Sumithrayo (NGO) field workers immediately after boxes were supplied (T1), 11 - 14 weeks later (T2), 30 weeks later (T3), and 18 months later (T4). Data on suicide and self-harm were collected from local police and hospitals. RESULTS: At T1 only 1.8% (7/396) of households reported locking up pesticides, 72.5% (279/385) easy access to pesticides for adults and 50.4% (195/387) easy access for children. At T3 most informants in households using pesticides reported using the box all (82.3%, 298/362) or most of the time (7.2%, 26/362). Informants usually reported always locking the box (92.8%, 336/362) and most boxes were locked on inspection (93.6%, 339/362). By T4 there was some reduction in reporting that the box was kept locked all of the time (75.2%, 267/355) and the box being locked on inspection (73.8%, 262/355). Easy child access to the key was reported in relatively few households (10.7% at T4), although interviewers judged that this was possible in rather more (20.6%). Most informants regarded the box as useful (100% at T3 and 99.4% at T4), with convenience for storage, security, avoiding wastage, and protection of children being major factors. A message on the box about how to deal with bad feelings and the importance of safer storage was well received. The locks had been broken or the key lost in a few households. CONCLUSION: Introduction of lockable boxes for storing pesticides to farming households in Sri Lanka appeared to be acceptable. Most households used the boxes responsibly, although there was some decline in the proper usage over time. A large-scale trial of lockable storage devices in farming households in rural areas as a means of prevention of suicide and accidental poisoning is now indicated.


simply a way to manipulate a situation to one's own advantage. The effects of alcohol misuse are especially important in understanding self-harm at the community level in terms of the impact they have on the domestic environment. Also, issues around "love affairs," arranged marriages and domestic physical, sexual or psychological abuse in the domestic environment are referred to by many self-harmers or their relatives as a reason for ingesting poison. Clearly, easy access to lethal pesticides by impulsive individuals often living under economically or psychosocially stressful conditions, combined with insufficient treatment facilities and limited outreach programs, can be a deadly blend. A strategy aimed at reducing the availability of the most toxic pesticides and improving case management should be implemented, as it is likely to reduce death from pesticides although unlikely to impact on the number of episodes. Support to families plagued by domestic violence and male alcohol misuse is essential to improve the quality of life for the most vulnerable and to reduce the number of self-harm episodes in the long-term.


BACKGROUND: Acute poisoning by agricultural pesticides is a well established global public health problem. Keeping pesticides under safe storage is now promoted as a potential way to reduce the number of severe poisoning cases. However, there have been no published studies documenting the feasibility of such an approach. Therefore, the objective of the study presented here was to determine community perceptions and use of in-house safe storage boxes for pesticides in rural Sri Lanka. METHODS: Boxes with a lock, to be used for the in-house safe storage of pesticides, were distributed to 200 randomly selected farming households in two agricultural communities. A baseline survey determined pesticide storage practices and household characteristics prior to distribution. The selected households were encouraged to make use of the box at community meetings and during a single visit to each household one month after distribution. No further encouragement was offered. A follow-up survey assessed storage practices seven months into the project. RESULTS: Following the distribution of the boxes the community identified a number of benefits including the protection of pesticide containers against exposure from the rain and sun and a reduced risk of theft. Data were analysed for 172 households that reported agricultural use of pesticides at follow-up. Of these, 141 (82%) kept pesticides in the house under lock against 3 (2%) at baseline. As expected, the distribution of boxes significantly reduced the number of households storing pesticides in the field, from 79 (48%) at baseline to 4 (2%) at follow-up. There was a significant increase in the number of households keeping pesticides safe from children between baseline (64%) and seven months after the distribution of boxes (89%). The same was true for adults although less pronounced with 51% at baseline and 66% at follow-up. CONCLUSION: The farming community appreciated the storage boxes and made storage of pesticides safer, especially for children. It seems that additional, intensive promotion is needed to ensure that pesticide boxes are locked. The introduction of in-house safe storage boxes resulted in a shift of storage into the farmer's home and away from the field and this may increase
the domestic risk of impulsive self-poisoning episodes. This increased risk
needs attention in future safe storage promotion projects.

developing countries--options for restricting the availability of pesticides." Toxicology

Hundreds of thousands of people are dying around the world each year from
the effects of the use, or misuse, of pesticides. This paper reviews the
different options to reduce availability of the most hazardous chemicals,
focusing on issues in developing countries. Emphasis is placed on the fatal
poisoning cases and hence the focus on self-harm cases. Overall, it is
argued here that restricting access to the most hazardous pesticides would
be of paramount importance to reduce the number of severe acute poisoning
cases and case-fatalities and would provide greater opportunities for
preventive programmes to act effectively. The aim should be to achieve an
almost immediate phasing out of the WHO Classes I and II pesticides
through national policies and enforcement. These short-term aims will have
to be supported by medium- and long-term objectives focusing on the
substitution of pesticides with safe and cost-effective alternatives, possibly
guided by the establishment of a Minimum Pesticide List, and the
development of future agricultural practices where pesticide usage is
reduced to an absolute minimum. Underlying factors that make individuals at
risk for self-harm include domestic problems, alcohol or drug addiction,
emotional distress, depression, physical illness, social isolation or financial
hardship. These should be addressed through preventive health programmes
and community development efforts.


BACKGROUND: Self-poisoning is one of the most common methods of
suicide worldwide. The intentional ingestion of pesticides is the main
contributor to such deaths and in many parts of rural Asia pesticide
self-poisoning is a major public health problem. To inform the development of
preventive measures in these settings, this study investigates small-area
variation in self-poisoning incidence and its association with area-based
socioeconomic and agricultural factors. METHODS: Ecological analysis of
intentional self-poisoning in a rural area (population 267,613) of Sri Lanka in
2002. The geographic distribution of cases was mapped to place of
residence. Using administrative division (GN), median population size 1416,
as unit of analysis, associations with socioeconomic and agricultural
indicators were explored using negative binomial regression models.
RESULTS: The overall incidence of intentional self-poisoning in the study
area was 315 per 100,000 (range: 0 - 2168 per 100,000 across GNs).
Socioeconomic disadvantage, as indexed by poor housing quality (p = 0.003)
and low levels of education (p < 0.001) but not unemployment (p = 0.147),
was associated with a low self-poisoning incidence. Areas where a high
proportion of the population worked in agriculture had low overall levels of
self-poisoning (p = 0.002), but a greater proportion of episodes in these
areas involved pesticides (p = 0.01). An association with extent of cultivated
land was found only for non-pesticide poisoning (p = 0.01). CONCLUSION:
Considerable small-area variation in incidence rates of intentional self-poisoning was found. The noteworthy concentration of cases in certain areas and the inverse association with socioeconomic deprivation merit attention and should be investigated using individual-level exposure data.


BACKGROUND: Deliberate self-poisoning with agricultural pesticides is the commonest means of suicide in rural Asia. It is mostly impulsive and facilitated by easy access to pesticides. The aim of this large observational study was to investigate the immediate source of pesticides used for self-harm to help inform suicide prevention strategies such as reducing domestic access to pesticides. METHODS: The study was conducted in a district hospital serving an agricultural region of Sri Lanka. Patients who had self-poisoned with pesticides and were admitted to the adult medical wards were interviewed by study doctors following initial resuscitation to identify the source of pesticides they have ingested. RESULTS: Of the 669 patients included in the analysis, 425 (63.5%) were male; the median age was 26 (IQR 20-36). In 511 (76%) cases, the pesticides had been stored either inside or immediately outside the house; among this group only eight patients obtained pesticides that were kept in a locked container. Ten percent (n = 67) of the patients used pesticides stored in the field while 14% (n = 91) purchased pesticides from shops within a few hours of the episode. The most common reasons for choosing the particular pesticide for self-harm were its easy accessibility (n = 311, 46%) or its popularity as a suicide agent in their village (n = 290, 43%). CONCLUSION: Three quarters of people who ingested pesticides in acts of self-harm used products that were available within the home or in close proximity; relatively few patients purchased the pesticide for the act. The study highlights the importance of reducing the accessibility of toxic pesticides in the domestic environment.


BACKGROUND: Policy analysis is often retrospective and not well suited to helping policy makers decide what to do; in contrast prospective policy analysis seeks to assist in formulating responses to challenging public policy questions. Suicide in Sri Lanka is a major public health problem, with ingestion of pesticides being the primary method. Previous policy interventions have been associated with reduced mortality through restricting access to the most toxic pesticides. Additional means of reducing access are still needed. METHODS: The prospective policy analysis comprised two stages. The first used a consensus activity within a well defined policy community to generate and frame policy options. The second broadened the analysis to include other stakeholders. We report the consensus activity with seven actors from agriculture, health, and academia. Policy options were identified through two rounds of discussion along with ratings by each
participant on their degree of support for each option. Data were analysed quantitatively and discussions analysed with Nvivo 8 to code prominent and recurrent themes. RESULTS: The main finding was the strong support and consensus for two proposals: further regulation of pesticides and the novel idea of repackaging pesticides into non-lethal doses. Participants identified several factors that were supportive of future policy change including a strong legislative framework, good links between agriculture, health and academia, and a collaborative relationship with industry. Identified barriers and potential threats to policy change included political interference, difficulties of intersectoral collaboration, acceptability of options to the community, difficulty of implementation in rural communities and the challenge of reducing mortality. CONCLUSIONS: The development and consideration of policy options within this epistemic community reflected an appreciation and understanding of many of the factors that can facilitate or thwart policy change. The understanding of context, evidence and ideas, implementation and impact influenced how the participants considered and rated the options. Use of epistemic community actors identified the level of support for each option, helped elaborate the particularities of context, as well as the power and influence of ideas. Further examination of the potential barriers and opportunities for these options will determine if broader consensus, involving a wider range of stakeholders, can be achieved and policy change promoted.


BACKGROUND: The WHO recognises pesticide poisoning to be the single most important means of suicide globally. Pesticide self-poisoning is a major public health and clinical problem in rural Asia, where it has led to case fatality ratios 20-30 times higher than self-poisoning in the developed world. One approach to reducing access to pesticides is for households to store pesticides in lockable "safe-storage" containers. However, before this approach can be promoted, evidence is required on its effectiveness and safety. METHODS/DESIGN: A community-based cluster randomised controlled trial has been set up in 44,000 households in the North Central Province, Sri Lanka. A census is being performed, collecting baseline demographic data, socio-economic status, pesticide usage, self-harm and alcohol. Participating villages are then randomised and eligible households in the intervention arm given a lockable safe storage container for agrochemicals. The primary outcome will be incidence of pesticide self-poisoning over three years amongst individuals aged 14 years and over. 217,944 person years of follow-up are required in each arm to detect a 33% reduction in pesticide self-poisoning with 80% power at the 5% significance level. Secondary outcomes will include the incidence of all pesticide poisoning and total self-harm. DISCUSSION: This paper describes a large effectiveness study of a community intervention to reduce the burden of intentional poisoning in rural Sri Lanka. The study builds on a strong partnership between provincial health services, local and international researchers, and local communities. We discuss issues in relation to
randomisation and contamination, engaging control villages, the intervention, and strategies to improve adherence.


BACKGROUND: Suicide in Sri Lanka is a major public health problem and in 1995 the country had one of the highest rates of suicide worldwide. Since then reductions in overall suicide rates have been largely attributed to efforts to regulate a range of pesticides. The evolution, context, events and implementation of the key policy decisions around regulation are examined. METHODS: This study was undertaken as part of a broader analysis of policy in two parts-an explanatory case study and stakeholder analysis. This article describes the explanatory case study that included an historical narrative and in-depth interviews. RESULTS: A timeline and chronology of policy actions and influence were derived from interview and document data. Fourteen key informants were interviewed and four distinct policy phases were identified. The early stages of pesticide regulation were dominated by political and economic considerations and strongly influenced by external factors. The second phase was marked by a period of local institution building, the engagement of local stakeholders, and expanded links between health and agriculture. During the third phase the problem of self-poisoning dominated the policy agenda and closer links between stakeholders, evidence and policymaking developed. The fourth and most recent phase was characterized by strong local capacity for policymaking, informed by evidence, developed in collaboration with a powerful network of stakeholders, including international researchers. CONCLUSIONS: The policy response to extremely high rates of suicide from intentional poisoning with pesticides shows a unique and successful example of policymaking to prevent suicide. It also highlights policy action taking place 'under the radar', thus avoiding policy inertia often associated with reforms in lower and middle income countries.


BACKGROUND: Continuous exposure to many chemicals, including through air, water, food, or other media and products results in health impacts which have been well assessed, however little is known about the total disease burden related to chemicals. This is important to know for overall policy actions and priorities. In this article the known burden related to selected chemicals or their mixtures, main data gaps, and the link to public health policy are reviewed. METHODS: A systematic review of the literature for global burden of disease estimates from chemicals was conducted. Global disease due to chemicals was estimated using standard methodology of the Global Burden of Disease. RESULTS: In total, 4.9 million deaths (8.3% of total) and 86 million Disability-Adjusted Life Years (DALYs) (5.7% of total) were attributable to environmental exposure and management of selected chemicals in 2004. The largest contributors include indoor smoke from solid fuel use, outdoor air pollution and second-hand smoke, with 2.0, 1.2 and 0.6 million deaths annually. These are followed by occupational particulates,
chemicals involved in acute poisonings, and pesticides involved in self-poisonings, with 375,000, 240,000 and 186,000 annual deaths, respectively. CONCLUSIONS: The known burden due to chemicals is considerable. This information supports decision-making in programmes having a role to play in reducing human exposure to toxic chemicals. These figures present only a number of chemicals for which data are available, therefore, they are more likely an underestimate of the actual burden. Chemicals with known health effects, such as dioxins, cadmium, mercury or chronic exposure to pesticides could not be included in this article due to incomplete data and information. Effective public health interventions are known to manage chemicals and limit their public health impacts and should be implemented at national and international levels.


Background: Suicidal behaviour, primarily through self-poisoning, is a major public health problem among youth in Sri Lanka. Methods: This article describes a qualitative study of student perspectives on suicidal behaviour and its prevention. Focus groups were held with students 17-20 years of age. A discussion of the perceived causes of suicidal behaviour provided the context for discussing prevention efforts. Conclusion: Participants identified pathways to suicidal behaviour and emphasized experiential aspects and the variability of fatal intent. Suggestions for prevention tended to emphasize the strengthening of community-oriented actions in order to better realize lethal means restrictions.


OBJECTIVES: To assess in a developing Asian country the impact of pesticide regulation on the number of deaths from poisoning. These regulations, which were implemented in Sri Lanka from the 1970s, aimed to reduce the number of deaths - the majority from self-poisoning - by limiting the availability and use of highly toxic pesticides. METHODS: Information on legislative changes was obtained from the Ministry of Agriculture, national and district hospital admission data were obtained from the Sri Lanka Health Statistics Unit, and individual details of deaths by pesticide poisoning were obtained from a manual review of patients' notes and intensive care unit records in Anuradhapura. FINDINGS: Between 1986 and 2000, the total national number of admissions due to poisoning doubled, and admissions due to pesticide poisoning increased by more than 50%. At the same time, the case fatality proportion (CFP) fell for total poisonings and for poisonings due to pesticides. In 1991_92, 72% of pesticide-induced deaths in Anuradhapura were caused by organophosphorus (OP) and carbamate pesticides - in particular, the WHO class I OPs monocrotophos and methamidophos. From 1991, the import of these pesticides was reduced
gradually until they were banned for routine use in January 1995, with a corresponding fall in deaths. Unfortunately, their place in agricultural practice was taken by the WHO class II organochlorine endosulfan, which led to a rise in deaths from status epilepticus - from one in 1994 to 50 in 1998. Endosulfan was banned in 1998, and over the following three years the number of endosulfan deaths fell to three. However, at the end of the decade, the number of deaths from pesticides was at a similar level to that of 1991, with WHO class II OPs causing the most deaths. Although these drugs are less toxic than class I OPs, the management of class II OPs remains difficult because they are, nevertheless, still highly toxic, and their toxicity is exacerbated by the paucity of available facilities. CONCLUSION: The fall in CFP amidst a rising incidence of self-poisoning suggests that Sri Lanka's programmes of pesticide regulation were beneficial. However, a closer inspection of pesticide-induced deaths in one hospital revealed switching to other highly toxic pesticides, as one was banned and replaced in agricultural practice by another. Future regulation must predict this switching and bear in mind the ease of treatment of replacement pesticides. Furthermore, such regulations must be implemented alongside other strategies, such as integrated pest management, to reduce the overall pesticide availability for self-harm.


Background: Restricting access to common means of suicide, such as firearms, toxic gas, pesticides and other, has been shown to be effective in reducing rates of death in suicide. In the present review we aimed to summarize the empirical and clinical literature on controlling the access to means of suicide. Methods: This review made use of both MEDLINE, ISI Web of Science and the Cochrane library databases, identifying all English articles with the keywords "suicide means", "suicide method", "suicide prediction" or "suicide prevention" and other relevant keywords. Results: A number of factors may influence an individual's decision regarding method in a suicide act, but there is substantial support that easy access influences the choice of method. In many countries, restrictions of access to common means of suicide has lead to lower overall suicide rates, particularly regarding suicide by firearms in USA, detoxification of domestic and motor vehicle gas in England and other countries, toxic pesticides in rural areas, barriers at jumping sites and hanging, by introducing "safe rooms" in prisons and hospitals. Moreover, decline in prescription of barbiturates and tricyclic antidepressants (TCAs), as well as limitation of drugs pack size for paracetamol and salicylate has reduced suicides by overdose, while increased prescription of SSRIs seems to have lowered suicidal rates. Conclusions: Restriction to means of suicide may be particularly effective in contexts where the method is popular, highly lethal, widely available, and/or not easily substituted by other similar methods. However, since there is some risk of means substitution, restriction of access should be implemented in conjunction with other suicide prevention strategies. 2011 by the authors; licensee MDPI, Basel, Switzerland.

BACKGROUND: The Palestinian Poison Control and Drug Information Center was established in 2006 to provide up-to-date information on medications and to help in the early diagnosis and management of poisoning cases. OBJECTIVES: To summarize the activities carried out by the PCDIC in the past 2 years. METHODS: Documented inquiries received at the PCDIC were analyzed and the Center's activities were extracted from the files. RESULTS: During the first 2 years of the Center's existence, 323 enquiries were received, mainly (67.2%) from physicians; 70% of the calls were from the city of Nablus. Unintentional poisoning was the leading type of call (62.8%) followed by suicidal poisoning (20.7%). Medications were the major category of toxicants encountered (48.9%), followed by pesticides (23.5%). In 67.9% of the cases, the calls were initiated before any treatment was provided. The advice provided by the PCDIC was based on the nature of the call. During these 2 years the PCDIC has conducted both academic and non-academic activities. The Center introduced the concept of poison prevention weeks in Palestine and has conducted two so far. The PCDIC has published several articles in the fields of toxicology, rational drug use, complementary and herbal therapy, pharmacoepidemiology, and self-medication. CONCLUSIONS: Documentation of all enquiries is mandatory for analysis, evaluation, comparative purposes and quality assurance. More information campaigns are needed to encourage people to use the services provided by the PCDIC.


Objectives: Pesticide self-poisoning is a major problem in developing countries, especially in rural areas, and an important reason is that hazardous pesticides are available without restrictions. Organophosphates (OPs) are the most commonly used pesticides for suicidal poisoning causing over 200,000 deaths in the world yearly. The authors present an alarming increase in fatal OP-related self-poisonings from 1996 to 2006 in the southeastern region of Serbia. Methods: Descriptive, retrospective epidemiological study. Results: National statistical data in Serbia show a 2.7% decrease in the total number of suicides from 1996 to 2006. In the same period, the number of fatal self-poisonings increased by 18%, from 108 to 128. Ni is the centre of the southeastern part of Serbia, which is a low-income region with a predominantly rural population. In the University Clinical Centre in Ni, the total number of cases of fatal self-poisonings increased from 11 in 1996 to 32 in 2006 (10% and 25% of the total numbers in Serbia in these two years). Of these cases, 5 were related to OPs in 1996, and 16 in 2006. Thus, the number of OP-related fatal self-poisonings has increased by 320% in the Ni region in the ten-year period, and currently accounts for 50% of all the suicidal poisonings in this region. Conclusion: Measures should be taken to restrict the availability of pesticides.

OBJECTIVE: Warangal district in Andhra Pradesh, southern India, records >1000 pesticide poisoning cases each year and hundreds of deaths. We aimed to describe their frequency and distribution, and to assess quality of management and subsequent outcomes from pesticide poisoning in one large hospital in the district. METHODS: We reviewed data on all patients admitted with pesticide poisoning to a district government hospital for the years 1997 to 2002. For 2002, details of the particular pesticide ingested and management were abstracted from the medical files. FINDINGS: During these 6 years, 8040 patients were admitted to the hospital with pesticide poisoning. The overall case fatality ratio was 22.6%. More detailed data from 2002 revealed that two-thirds of the patients were <30 years old, 57% were male and 96% had intentionally poisoned themselves. Two compounds, monocrotophos and endosulfan, accounted for the majority of deaths with known pesticides in 2002. Low fixed-dose regimens were used in the majority of cases for the most commonly used antidotes (atropine and pralidoxime). Inappropriate antidotes were also used in some patients. CONCLUSIONS: It is likely that these findings reflect the situation in many rural hospitals of the Asia Pacific region. Even without an increase in resources, there appear to be significant opportunities for reducing mortality by better medical management and further restrictions on the most toxic pesticides.


This report describes the characteristics of patients with acute pesticide poisoning in a rural area of Sri Lanka and, for intentional self-poisoning cases, explores the relative importance of the different determinants. Data were collected for 239 acute pesticide-poisoning cases, which were admitted to two rural hospitals in Sri Lanka. Sociodemographic characteristics, negative life events and agricultural practices of the intentional self-poisoning cases were compared with a control group. Most cases occurred among young adults and the large majority (84%) was because of intentional self-poisoning. Case fatality was 18% with extremely high case fatality for poisoning with the insecticide endosulfan and the herbicide paraquat. Cases were generally younger than controls, of lower educational status and were more often unemployed. No agricultural risk factors were found but a family history of pesticide poisoning and having ended an emotional relationship in the past year was clearly associated with intentional self-poisoning. The presence of mental disorders could only be assessed for a subsample of the cases and controls and this showed that alcohol dependence was a risk factor. This study shows that acute pesticide poisoning in Sri Lanka is determined by a combination of sociodemographic and psychological factors. Suggestions are given for interventions that could control the morbidity and mortality due to acute pesticide poisoning in developing countries.

BACKGROUND: Acute poisoning, especially deliberate self-poisoning with agricultural pesticides, is an emerging global public health problem, but reliable incidence estimates are lacking. Only a few previous studies have assessed the impact of regulatory or other preventive measures.

OBJECTIVE: To estimate trends in incidence and causes of acute poisoning over time in rural Sri Lanka, and to assess the possible impact of policies that aimed to restrict availability of highly toxic pesticides.


RESULTS: Data of 8,110 admissions for acute poisoning were available for analysis. Most cases were young adults, who deliberately self-poisoned themselves with pesticides, males outnumbering females. Average incidence rate of acute poisoning over the study period was 318 per 100,000 (95% confidence interval [CI], 311 to 325). Incidence of all poisoning showed an increase over the period of study. However, this increase was lower for pesticide poisoning, and the mortality rate and case fatality ratio of pesticides went down towards the end of the 1990s. The decline in mortality was attributed to regulatory controls for the group of highly hazardous organophosphorus compounds implemented in 1995 and for the organochlorine endosulfan in 1998.

CONCLUSIONS: Regulatory control of highly toxic pesticides provides important health benefits, especially in terms of lower number of deaths from self-poisoning. However, despite the positive effect of these bans, many deaths from pesticide self-poisoning still occur after ingestion of agricultural pesticides classified as only moderately poisonous.


BACKGROUND: Pesticide suicides are considered the single most important means of suicide worldwide. Centralized pesticide storage facilities have the possible advantage of delaying access to pesticides thereby reducing suicides. We undertook this study to examine the feasibility and acceptability of a centralized pesticide storage facility as a preventive intervention strategy in reducing pesticide suicides.

METHODS: A community randomized controlled feasibility study using a mixed methods approach involving a household survey; focus group discussions (FGDs) and surveillance were undertaken. The study was carried out in a district in southern India. Eight villages that engaged in floriculture were identified. Using the lottery method two were randomized to be the intervention sites and two villages constituted the control site. Two centralized storage facilities were constructed with local involvement and lockable storage boxes were constructed. The household survey conducted at baseline and one and a half years later documented information on sociodemographic data, pesticide usage, storage and suicides.

RESULTS: At baseline 4446 individuals (1097 households) in the intervention and 3307 individuals (782 households) in the control sites were recruited while at follow up there were 4308 individuals (1063 households) in the intervention and 2673 individuals (632 households) in the control sites. There were differences in baseline characteristics and imbalances in the prevalence of suicides between intervention and control sites as this was a small feasibility study. The results from the FGDs revealed that most
participants found the storage facility to be both useful and acceptable. In addition to protecting against wastage, they felt that it had also helped prevent pesticide suicides as the pesticides stored here were not as easily and readily accessible. The primary analyses were done on an Intention to Treat basis. Following the intervention, the differences between sites in changes in combined, completed and attempted suicide rates per 100,000 person-years were 295 (95% CI: 154.7, 434.8; p < 0.001) for pesticide suicide and 339 (95% CI: 165.3, 513.2, p < 0.001) for suicide of all methods. CONCLUSIONS: Suicide by pesticides poisoning is a major public health problem and needs innovative interventions to address it. This study, the first of its kind in the world, examined the feasibility of a central storage facility as a means of limiting access to pesticides and, has provided preliminary results on its usefulness. These results need to be interpreted with caution in view of the imbalances between sites. The facility was found to be acceptable, thereby underscoring the need for larger studies for a longer duration. TRIAL REGISTRATION ISRCTN: ISRCTN04912407.


In 15% to 20% of self-poisoning cases, the pesticides used are purchased from shops just prior to ingestion. We explored how pesticide vendors interacted with customers at risk of self-poisoning to identify interventions to prevent such poisonings. Two strategies were specifically discussed: selling pesticides only to farmers bearing identity cards or customers bearing pesticide 'prescriptions'. Vendors reported refusing to sell pesticides to people thought to be at risk of self-poisoning, but acknowledged the difficulty of distinguishing them from legitimate customers; vendors also stated they did want to help to improve identification of such customers. The community did not blame vendors when pesticides used for self-poisoning were purchased from their shops. Vendors have already taken steps to restrict access, including selling low toxic products, counselling and asking customer to return the next day. However, there was little support for the proposed interventions of 'identity cards' and 'prescriptions'. Novel public health approaches are required to complement this approach.


BACKGROUND: Self-poisoning with pesticides is the cause of an estimated 300,000 deaths annually in rural Asia. The great majority of these deaths are from impulsive acts of self-harm using pesticides that are readily available in the home. The secure storage of pesticides under lock has been emphasized as a possible answer to the problem. This aspect, however, has been poorly researched. In this paper, we report on the design and use, in rural Sri Lanka, of a variety of different lockable storage devices. METHODS: Following a baseline survey of pesticide storage practices, randomly selected households received a pesticide safe storage device. The study was conducted in two phases. In the first phase a total of 200 households in two villages were provided with in-house safe storage devices and two follow-up
surveys were conducted seven and 24 months after distribution. The results of the seven month post-distribution survey have already been published. In the second phase, a further 168 households were selected in two additional villages and given a choice between an in-house and an in-field storage device and a follow-up survey conducted seven months after distribution. Both follow-up surveys aimed to assess the use of the device, obtain detailed user feedback on the different storage designs, and to identify problems faced with safeguarding the key. Twelve focus group discussions were held with representatives of households that received a storage device to derive from the community qualitative feedback on the design requirements for such devices. RESULTS: One hundred and sixty one of the 200 households selected during the first phase were using pesticides at the time of the follow-up survey, 24 months after distribution. Of these 161 households 89 (55%) had the pesticides stored and locked in the provided device. Among the 168 households that were given a choice between an in-house and an in-field storage device 156 used pesticides at the time of survey and of these 103 (66%) selected in-field storage devices and 34% chose in-house storage devices. Of the 156 households, 106 (68%) stored all pesticides in a locked storage device at the time of the follow-up survey seven months after distribution. The majority of households that received an in-field storage device chose to install the device within their compound rather than in the field as they were concerned about the possibility of theft. The preferred design of the storage device was influenced by a number of occupational factors such as land size, crop patterns, types and the quantity of pesticides used. The presence of termites, perceived safety, material used to manufacture the device and ease of location influenced their choice. The study revealed that it was difficult to keep the key to the device hidden from children; and that the person in charge of the key would have easy access to the stored poison. CONCLUSION: This study confirms the high acceptance of lockable storage devices by the community although the use of the device reduced over time. A large proportion of pesticides stored within the compound after the introduction of the device may have implications for accessibility to pesticides in the domestic environment. The ability of other household members, including children, to easily find the key is also worrying.


As the largest continent in the World, Asia accounts for about 60% of World suicides. Preventing suicide by restricting access to suicide methods is one of the few evidence-based suicide prevention strategies. However, there has been a lack of systematic exploration of suicide methods in Asian countries. To amend this shortage, the current review examines the leading suicide methods in different Asian countries, their trend, their age- and sex- specific characteristics, and their implications for suicide prevention. In total, 42 articles with leading suicide methods data in 17 Asian countries/regions were retrieved. The epidemiologic characteristics and recent trends of common suicide methods reflect specific socio-cultural, economic, and religious situations in the region. Common suicide methods shift with the introduction of technologies and constructions, and have specific age- or sex-characteristics that may render the restriction of suicide methods not
equally effective for all sex and age sub-groups. Charcoal burning, pesticide poisoning, native plant poisoning, self-immolation, and jumping are all prominent examples. In the information society, suicide prevention that focuses on suicide methods must monitor and control the innovation and spread of knowledge and practices of suicide “technologies”. It may be more cost-effective to design safety into technologies as a way of suicide prevention while there is no rash of suicides yet by the new technologies. Further research on suicide methods is important for public health approaches to suicide prevention with sensitivity to socio-cultural, economic, and religious factors in different countries.