



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

**Bibliography: Asia**

Ab Rahman, A. F. (2002). "Drug and chemical poisoning admissions at a teaching hospital in Malaysia." Hum Exp Toxicol **21**(7): 377-381.

A retrospective review of medical records was carried out to determine the pattern of drug and chemical poisoning cases admitted to a teaching hospital in Malaysia. Medical records of patients admitted during the period January 1987 to December 1995 were reviewed. They accounted for 0.2% of total admissions during the period. While all ages were represented, there was predominance of children, which showed little change throughout the nine-year period. Of all cases of poisoning, 77.8% were unintentional, 12.6% intentional and 9.6% were undetermined. Kerosene, pesticides and medicinal substances remained the common agents associated with poisoning. A significant number of patients sought treatment elsewhere before being admitted to the hospital. Of those who came directly to the hospital, many were presented late in the course of their poisoning. Only seven patients died and none were children. This study supports the need for greater emphasis on prevention of poisoning in children and among farmers in the state.

Abeyasinghe, R. and D. Gunnell (2008). "Psychological autopsy study of suicide in three rural and semi-rural districts of Sri Lanka." Soc Psychiatry Psychiatr Epidemiol **43**(4): 280-285.

**BACKGROUND:** Knowledge concerning the epidemiology of suicide in Sri Lanka is limited despite its suicide rates being amongst the highest in the world. **AIM:** To examine the characteristics of a large sample of Sri Lankan suicides to inform approaches to prevention. **METHOD:** Psychological autopsy study of suicides occurring in three rural districts of Sri Lanka during August-October 1997. **RESULTS:** Interviews were conducted with contacts of 372 (74%) of the 499 suicides that occurred over the study period. Males accounted for 79% of the deaths. Twenty-one percent of male and 57% of female suicides were aged <25 years of age. Pesticide self-poisoning accounted for 259 (70%) of the deaths. Almost two-thirds (62%) of the deaths occurred in hospital and 95 (26%) had made previous suicidal gestures. 138 (37%) were moderately or severely depressed and 144 (49%) of male suicides, but only 2 (2.5%) of the females, were alcohol dependent. Illegally brewed alcohol (kasippu) was the main product used by two thirds (62%) of problem drinkers. There was a family history of suicide in 20% of cases. **CONCLUSION:** Pesticide self-poisoning accounts for over two thirds of suicides in rural Sri Lanka. Suicide prevention efforts in Sri Lanka should focus on restricting access to pesticides, improving the medical management of pesticide poisoning, reducing alcohol misuse-particularly targeting the supply of illegal alcohol-and improving the identification and aftercare of people who self-harm.

Afandiyev, I. N. (2009). "Epidemiology of acute chemical poisonings in Azerbaijan." Clinical Toxicology Conference: 29th International Congress of the European Association of Poison Centres and Clinical Toxicologists Stockholm Sweden. Conference Start: 20090512 Conference End: 20090515. Conference Publication: (var.pagings). 47 (5): 505.

Objective: Epidemiologic data on acute chemical poisonings in Azerbaijan Republic is very limited.1. The purpose of this pilot study was to evaluate and

analyze the rate and characteristics of acute chemical poisoning cases in Azerbaijan. Methods: This investigation was performed on the data of poisoned patients admitted to the Republican Toxicology Center of the Ministry of Health of Azerbaijan in Baku city from 1st January to 31st December, 2007. Results: There were 1182 hospitalizations in the Republican Toxicology Center's (RTC) intensive care unit. 65.3% of patients were admitted to RTC within 2 hours of exposure. The mean length of hospitalization was 3.2 days. The youngest patient was ten days old and the oldest 82 years old. Acute intoxications were more frequent among males (51.4 %) and in 20-40 age group. The majority of patients (84.4%) were urban inhabitants. Pharmaceuticals were the most common cause of poisonings (31.9%). Among the pharmaceutical drug poisonings psychotropic medicines (45.6%) were the most frequent. The other cases of poisonings were inhalation of gases (14.6%); corrosives (14.9%); pesticides (3.3%); hydrocarbons (1.5%); alcohol (4.2%); opiates (4.2%); snake and spider bites (5.7%); mushrooms (0.4%) and others (19.3%). The most frequent cause was accidental poisoning (56.9%), followed by intentional and occupational poisonings. The mortality rate was 3.1%. Corrosive liquid (especially - concentrated acetic acid) poisonings were the most frequent cause of fatalities (40.5% of total mortality). Conclusion: These data provide preliminary epidemiological information about acute chemical poisoning cases in the Azerbaijan Republic. Further research is required.

Agampodi, S., K. Wickramage, et al. (2014). "Maternal mortality revisited: the application of the new ICD-MM classification system in reference to maternal deaths in Sri Lanka." *Reprod Health* 11(1): 17.

**BACKGROUND:** The recently published WHO guidelines on applications of ICD-10 to deaths during pregnancy, childbirth, and the puerperium (ICD-MM) aimed at enabling a comprehensive framework for international comparison of maternal deaths, which includes maternal suicides as a direct cause of maternal deaths. At present, most developing countries do not include suicide as a maternal death. **METHODS:** We extracted and analysed data from the maternal death surveillance system in North Central Province of Sri Lanka for the period of 2005 to 2011, in order to identify the implications of this new classification on maternal mortality estimates. All reported deaths of pregnant women and women within 12 months of termination of pregnancy were included in this study. Causes of deaths were extracted and coded using ICD-10 reclassified according to new ICD-MM for maternal deaths. **RESULTS:** Of the 118 deaths analysed, the maternal death investigation system had classified 53 (44.9%) deaths as maternal deaths. These 53 maternal deaths included one deaths due to suicided, out of 21 (17.8%) suicide deaths among 118 reported deaths. Application of the new ICD-MM showed 83 maternal deaths which resulted in a 56.6% increase of number of maternal deaths in the province. Detailed analysis of all individual causes by ICD 10 codes showed that intentional self-poisoning by an exposure to pesticide (ICD code X63) as the leading cause of maternal deaths in NCP (n = 11, 13.3% of all maternal deaths) during this period. The estimated MMR in the study area based on the new classification in years 2009, 2010 and 2011 was 115, 103 and 88 per 100,000 live births respectively. **CONCLUSIONS:** The new classification system may have an immediate effect in raising

maternal mortality thresholds, making the MDG Goal 5A more elusive for many countries. However, this new approach may ultimately lead to a more accurate understanding of maternal mortality, as well as the real number of maternal deaths attributed to suicide. This more accurate accounting has implications for policymakers and practitioners globally as they strive to meet women's needs during pregnancy, including attention to detection and treatment for maternal depression, given its close correlation with maternal suicide.

Alex, R., J. Prasad, et al. (2007). "Self-poisoning with pesticides in India." Br J Psychiatry **190**: 274-275.

Ambade, V. N. (2004). "Self injection of insecticide." J Assoc Physicians India **52**: 169-170.

Avsarogullari, L., V. Senol, et al. (2012). "Characteristics of acute adult poisonings in a university hospital emergency department in central Turkey: a three-year analysis." J Pak Med Assoc **62**(2): 129-133.

**OBJECTIVE:** To evaluate the etiologic and demographic characteristics of acute adult poisoning cases and to obtain up-to-date information on acute poisonings. **METHODS:** A retrospective study was conducted to evaluate 1254 adults who presented with acute poisoning to the Emergency Department of our tertiary care university hospital in central Turkey from January 2007 to December 2009. The data extracted from each chart related to age, gender, marital status, agent involved in the poisoning, season of event, route of poisoning, time between ingestion or exposure and arrival at the casualty ward, mechanism of toxic exposure (unintentional or intentional), level of consciousness, length of stay in the ward, and outcome. **RESULTS:** Acute poisonings comprised 1.40% of Emergency Department patients; 65% were female, while 47% were between the ages of 16 and 25 years. Medicinal drugs were the most common cause of poisonings (68%), followed by gases (9.5%). Antidepressants were the most frequent drug ingested (18%), followed by analgesics (16%). Intentional poisonings constituted the majority of cases (78%). Most suicide attempts were made by women (68%) and majority of the patients were married (57%). Twenty patients (1.6%) died during their hospital stay, with organophosphate pesticides being the most common agent (n = 8) involved in fatal poisonings. **CONCLUSION:** Pharmaceutical agents, carbon monoxide and pesticides are the three most common poisoning agents. Deliberate self-poisoning is common in adults in the area of the study; the risk being highest in females and younger adults. These up-to-date data provide important information on the characteristics of acute poisonings and can guide activities such as professional training, preventive measures, community education and new research.

Bandara Gawarammana, I., D. M. Roberts, et al. (2010). "Acute human self-poisoning with bispyribac-containing herbicide Nominee: a prospective observational study." Clin Toxicol (Phila) **48**(3): 198-202.

**INTRODUCTION:** Self-poisoning with herbicides is an important reason for hospital admission and death in Asia. Although some herbicides have a well-described toxicity profile in humans, many of the newer compounds rely

on extrapolation from animal results as no published literature on clinical outcomes of human self-poisoning has been described. One example of these compounds is bispyribac, a selective herbicide used in rice and wheat cultivation that is marketed in two containers, one containing bispyribac 400 g/L with a solvent and the other the surfactant, polyethylene glycol. We present the first case series of acute human self-poisoning with an herbicide product containing bispyribac. METHODS: Clinical data for all patients who presented with acute poisoning from a bispyribac-containing herbicide (Nominee) to two general hospitals in Sri Lanka from June 2002 to January 2009 were collected prospectively. Admission and serial blood samples were collected from consenting patients to confirm exposure and to study the toxicokinetics of bispyribac, respectively. RESULTS: One hundred ten patients with a history of bispyribac ingestion presented after a median time of 4 h post-ingestion. There were three deaths at 15, 6, and 5 h post-ingestion because of asystolic cardiac arrest. All three patients had reduced Glasgow Coma Score (GCS) (3, 12, and 13, respectively) of whom the former two had co-ingested ethanol and developed tonic-clonic seizures. Admission blood sample was obtained from the former two of these patients but bispyribac was detected in only one of these patients. The other patient presented 2.5 h post-ingestion with a GCS of 12 but bispyribac was not detected. Excluding the patient with undetectable bispyribac, a conservative estimate of the case fatality ratio at 1.81% (95% confidence interval 0.32-5.8) can be made. The majority of the remaining patients had self-limiting upper gastrointestinal symptoms and eight patients had an abnormal GCS on presentation to hospital. The overall median hospital stay was 3 days. Bispyribac was not detectable on admission in 21 patients; in the remaining patients, the median plasma concentration was 50.55 microg/mL (interquartile range 1.28-116.5; n=32). The peak concentration was noted around 3 h post-ingestion and plasma bispyribac concentration did not predict the severity of poisoning. CONCLUSION: The majority of patients developed self-resolving symptoms and were successfully managed in rural general hospitals without transfer to larger tertiary hospitals. Patients who died developed significant poisoning within 6 h and plasma bispyribac concentrations did not appear to predict mortality. The lack of correlation between bispyribac outcomes and the available plasma concentrations may be because of exposure to nonbispyribac components or other undefined factors. Clinical outcomes from acute self-poisoning with bispyribac-containing herbicides appear to be relatively more favorable than other commonly used herbicides.

Banerjee, I., S. K. Tripathi, et al. (2014). "Clinico-epidemiological profile of poisoned patients in emergency department: A two and half year's single hospital experience." *Int J Crit Illn Inj Sci* 4(1): 14-17.

CONTEXT: Poisoning is a common cause for attending emergency department of hospitals. AIMS: To explore the epidemiological characteristics and clinical profile of patients presenting with poisoning in emergency department. SETTINGS AND DESIGN: Prospective, cross-sectional, hospital-based study. MATERIALS AND METHODS: Relevant epidemiological and clinical data from patients, presenting with history/clinical features of poisoning in emergency department of a tertiary care district

hospital in India, were collected and analyzed. STATISTICAL ANALYSIS: DATA ANALYSIS WAS DONE BY USING DESCRIPTIVE AND INFERENCE STATISTICAL METHODS: Frequency, percentage, mean, and standard deviation (SD). A two-tailed  $P < 0.05$  was considered to be statistically significant. RESULTS: A total of 4,432 patients with history and clinical features of poisoning were included in the study. The females clearly outnumbered male patients. Poisoning with suicidal intent was more frequent (81.08%) than accidental (18.92%) ( $P < 0.0001$ ). Majority of the patients were housewives followed by farmers, businessmen, laborers, and students. The mean time interval between poison consumption and admission to hospital was 6.4 hours (Mean  $\pm$  SD: 6.4  $\pm$  2.29). Snakebite (31.90%) was the most common cause of poisoning followed by organophosphorus compounds (21.84%), rodenticide (16.49%), alcohol (13.80%), chemicals (9.04%), and drugs (2.3%). The mean GCS (Glasgow Coma Scale) score of the poisoned patients at presentation was 6.85  $\pm$  1.62. Of all the patients included in the study, 3,712 patients (83.76%) survived and 720 patients (16.24%) expired. CONCLUSIONS: The current piece of work suggests that most of the poisoning cases involved young age group particularly females. Snakebite and organophosphorus compounds contributed most of the poisoning cases which calls for urgent government initiatives for improvement in proper lighting of the district to prevent snakebite and controlled use of pesticides.

Banerjee, S., A. N. Chowdhury, et al. (2009). "Deliberate self-harm and suicide by pesticide ingestion in the Sundarban region, India." Trop Med Int Health **14**(2): 213-219.

OBJECTIVE: To examine the clinical epidemiology, including case fatality and determinants of self-harm in six island blocks of the Sundarban region of West Bengal, India. METHODS: We examined the clinical records of 1277 patients admitted for deliberate self-harm (DSH) to the six island hospitals from 1999 to 2001. RESULTS: 77.7% of the patients survived their attempt, 11.9% died and for 10.4% the outcome was not recorded. Women accounted for 65.2% of the DSH admissions and 67.1% of the deaths. Pesticides were the most commonly used means (88.7%). The case fatality of self-harm reported in these hospitals ranged from 6.0% to 50.0% (mean 13.3%; CI, 11.3-15.3). The age group 55-64 years was at highest risk of death, the age group 15-24 years at lowest risk. Higher lethality of pesticide ingestion compared to other methods was suggestive but not significant. Case fatality within the region varied but was high compared to industrialized nations. Case records and management of DSH were poor. CONCLUSION: Effective DSH prevention in the Sundarban region would require better surveillance at clinical facilities and an intersectoral approach, linking the agricultural interests of pesticide safety and mental health interests for preventing DSH.

Banerjee, S., A. N. Chowdhury, et al. (2013). "Household survey of pesticide practice, deliberate self-harm, and suicide in the sundarban region of West Bengal, India." BioMed Research International **2013**(949076).

The toxicological impact and intentional ingestion of pesticides are major public health concerns globally. This study aimed to estimate the extent of

deliberate self-harm (DSH) and suicides (suicidal behaviour) and document pesticide practices in Namkhana block of the Sundarban region, India. A cross-sectional study was conducted in 1680 households (21 villages) following a mixed random and cluster design sampling. The survey questionnaire (Household Information on Pesticide Use and DSH) was developed by the research team to elicit qualitative and quantitative information. The Kappa statistic and McNemar's test were used to assess the level of agreement and association between respondents' and investigators' opinions about safe storage of pesticides. Over five years, 1680 households reported 181 incidents of suicidal behaviour. Conflict with family members was the most frequently reported reason for suicidal behaviour (53.6%). The Kappa statistic indicated poor agreement between respondents and investigators about safe storage of pesticides. The pesticide-related annual DSH rate was 158.1 (95% CI 126.2-195.5), and for suicide it was 73.4 (95% CI 52.2-100.3) per 100,000. Unsafe pesticide practice and psychosocial stressors are related to the high rates of suicidal behaviour. An intersectoral approach involving the local governments, agricultural department and the health sector would help to reduce the magnitude of this public health problem. 2013 Sohini Banerjee et al.

Biswas, S., K. K. Mondal, et al. (2010). "Study of victims of organophosphorus compound poisoning: evaluation after medicolegal autopsy." J Indian Med Assoc **108**(9): 568-570.

Indiscriminate use of organophosphorus compounds (OPC) increases the potential threat of self-poisoning and death. To make a conclusive diagnosis on academic interest a retrospective record-based study was undertaken. Postautopsy studies were carried out on 100 victims of OPC poisoning by collecting data from following 3 sources: Medicolegal autopsy reports, inquest reports, and inpatient case sheets. Mode of ingestion of OPC was to commit suicide. Incidence was more in 20 to 30 years age group, in females and in urban area. Diagnosis was confirmed by history of poison exposure, clinically well-defined cholinergic effects, and characteristic autopsy findings. Early and correct identification of the cause of poisoning enables specific treatment. Restrictions on access of very toxic pesticides through national policies and enforcement, public education on storage and safe use, early recognition of poisoning, and appropriate medical management may reduce the incidence of poisoning and death.

Bose, A., F. Konradsen, et al. (2006). "Mortality rate and years of life lost from unintentional injury and suicide in South India." Tropical Medicine and International Health **11** (10): 1553-1556.

We calculated mortality rates and years of life lost because of unintentional injuries and suicides using community based information obtained prospectively over a 7-year period, from 1998 to 2004, among a rural and peri-urban population of 108 000 in South India. Per 100 000 population the total mortality rate for unintentional injuries and suicides combined was 137.1, with 54.9 for unintentional injuries and 82.2 for suicides respectively. Hanging and self-poisoning with pesticides were the preferred means of suicide. Unintentional injuries and suicides resulted in 26.9% of total life years lost over the study period while 18.9% of all deaths in the population

were attributable to unintentional injuries and suicides in the same period. The high burden is particularly notable in the 15-29 age group, where up to 70% of years of life lost are due to injury. The burden of injuries reported in this study is significantly higher than the figures reflected in available reports for India and is likely due to the under reporting in routine mortality statistics, particularly of suicides. 2006 Blackwell Publishing Ltd.

Bose, A., C. Sandal Sejbaek, et al. (2009). "Self-harm and self-poisoning in southern India: choice of poisoning agents and treatment." Trop Med Int Health **14**(7): 761-765.

**OBJECTIVE:** To record cases of suicide and attempted suicide among a population of 108 000 people living in a primarily rural area of southern India, with the aim of guiding policies and strategies to restrict access to poisonous compounds at community level. **METHOD:** Community-based surveillance over a period of 2 years. **RESULTS AND CONCLUSION:** The overall suicide rate was 71.4 per 100 000 population; the highest burden was among men. Most people died through hanging (81, 54%) and self-poisoning (46, 31%). Of the 46 who died from self-poisoning, 78.3% had taken pesticides and 19.7% had eaten poisonous plants. Eighty per cent of the self-poisoning cases obtained the poisonous substance in or in close proximity to the home, highlighting the importance of safe storage in the domestic environment. Of the 110 fatal and non-fatal self-poisoning cases, 87 (57.5%) were taken for treatment; 50 (57.4%) went to government hospitals and 37 (42.5%) to private facilities. This indicates the importance of including the private sector in the efforts to improve case management. Furthermore, the fact that 31 (67%) of the self-poisoning patients, who eventually died, were alive after 4 h provides an incentive to focus on improved case management and access to health services.

Carroll, R., C. Metcalfe, et al. (2012). "Diurnal variation in probability of death following self-poisoning in Sri Lanka--evidence for chronotoxicity in humans." Int J Epidemiol **41**(6): 1821-1828.

**BACKGROUND:** The absorption, distribution, metabolism and elimination of medicines are partly controlled by transporters and enzymes with diurnal variation in expression. Dose timing may be important for maximizing therapeutic and minimizing adverse effects. However, outcome data for such an effect in humans are sparse, and chronotherapeutics is consequently less practised. We examined a large prospective Sri Lankan cohort of patients with acute poisoning to seek evidence of diurnal variation in the probability of survival. **METHODS:** In all, 14 840 patients admitted to hospital after yellow oleander (*Cascabela thevetia*) seed or pesticide [organophosphorus (OP), carbamate, paraquat, glyphosate] self-poisoning were investigated for variation in survival according to time of ingestion. **RESULTS:** We found strong evidence that the outcome of oleander poisoning was associated with time of ingestion ( $P < 0.001$ ). There was weaker evidence for OP insecticides ( $P = 0.041$ ) and no evidence of diurnal variation in the outcome for carbamate, glyphosate and paraquat pesticides. Compared with ingestion in the late morning, and with confounding by age, sex, time of and delay to hospital presentation and year of admission controlled, case fatality of oleander poisoning was over 50% lower following evening ingestion (risk ratio



= 0.40, 95% confidence interval 0.26-0.62). Variation in dose across the day was not responsible. CONCLUSIONS: We have shown for the first time that timing of poison ingestion affects survival in humans. This evidence for chronotoxicity suggests chronotherapeutics should be given greater attention in drug development and clinical practice.

Cha, E. S., Y. H. Khang, et al. (2014). "Mortality from and Incidence of Pesticide Poisoning in South Korea: Findings from National Death and Health Utilization Data between 2006 and 2010." *PLoS One* **9**(4): e95299.

Pesticide poisoning has been recognized as an important public health issue around the world. The objectives of this study were to report nationally representative figures on mortality from and the incidence of pesticide poisoning in South Korea and to describe their epidemiologic characteristics. We calculated the age-standardized rates of mortality from and the incidence of pesticide poisoning in South Korea by gender and region from 2006 through 2010 using registered death data obtained from Statistics Korea and national healthcare utilization data obtained from the National Health Insurance Review and Assessment Service of South Korea. During the study period of 2006 through 2010, a total of 16,161 deaths and 45,291 patients related to pesticide poisoning were identified, marking respective mortality and incidence rates of 5.35 and 15.37 per 100,000 population. Intentional self-poisoning was identified as the major cause of death due to pesticides (85.9%) and accounted for 20.8% of all recorded suicides. The rates of mortality due to and incidence of pesticide poisoning were higher in rural than in urban areas, and this rural-urban discrepancy was more pronounced for mortality than for incidence. Both the rate of mortality due to pesticide poisoning and its incidence rate increased with age and were higher among men than women. This study provides the magnitude and epidemiologic characteristics for mortality from and the incidence of pesticide poisoning at the national level, and strongly suggests the need for further efforts to prevent pesticide self-poisonings, especially in rural areas in South Korea.

Chandrasena, R. (1981). "A transcultural evaluation of 'self poisoning' in Sri Lanka." *International Journal of Social Psychiatry* **27** (2): 119-123.

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.

Chang, S. S., T. H. Lu, et al. (2012). "Factors associated with the decline in suicide by pesticide poisoning in Taiwan: a time trend analysis, 1987-2010." *Clin Toxicol (Phila)* **50**(6): 471-480.

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.

Chang, S. S., T. H. Lu, et al. (2012). "The impact of pesticide suicide on the geographic distribution of suicide in Taiwan: a spatial analysis." BMC Public Health **12**: 260.

**BACKGROUND:** Pesticide self-poisoning is the most commonly used suicide method worldwide, but few studies have investigated the national epidemiology of pesticide suicide in countries where it is a major public health problem. This study aims to investigate geographic variations in pesticide suicide and their impact on the spatial distribution of suicide in Taiwan. **METHODS:** Smoothed standardized mortality ratios for pesticide suicide (2002-2009) were mapped across Taiwan's 358 districts (median population aged 15 or above = 27 000), and their associations with the size of agricultural workforce were investigated using Bayesian hierarchical models. **RESULTS:** In 2002-2009 pesticide poisoning was the third most common suicide method in Taiwan, accounting for 13.6% (4913/36 110) of all suicides. Rates were higher in agricultural East and Central Taiwan and lower in major cities. Almost half (47%) of all pesticide suicides occurred in areas where only 13% of Taiwan's population lived. The geographic distribution of overall suicides was more similar to that of pesticide suicides than non-pesticide suicides. Rural-urban differences in suicide were mostly due to pesticide suicide. Areas where a higher proportion of people worked in agriculture showed higher pesticide suicide rates (adjusted rate ratio [ARR] per standard deviation increase in the proportion of agricultural workers = 1.58, 95% Credible Interval [CrI] 1.44-1.74) and overall suicide rates (ARR = 1.06, 95% CrI 1.03-1.10) but lower non-pesticide suicide rates (ARR = 0.91, 95% CrI 0.87-0.95). **CONCLUSION:** Easy access to pesticides appears to influence the geographic distribution of suicide in Taiwan, highlighting the

potential benefits of targeted prevention strategies such as restricting access to highly toxic pesticides.

Chang, S. S., J. A. Sterne, et al. (2010). "'Hidden' suicides amongst deaths certified as undetermined intent, accident by pesticide poisoning and accident by suffocation in Taiwan." *Soc Psychiatry Psychiatr Epidemiol* **45**(2): 143-152.

OBJECTIVE: To identify cause-of-death categories in which suicides might be misclassified in Taiwan. METHODS: We plotted secular trends (1971-2007) in sex- and method-specific rates of deaths classified as suicide, undetermined intent and accident for the Taiwanese population aged 15+ and compared the sex, age and marital status profiles of deaths in these three categories by method of death. RESULTS: The demographic profiles of registered suicides generally resembled those for deaths of undetermined intent and accidents by pesticide poisoning/suffocation but differed from those for accidents from non-pesticide poisoning/drowning/falling/poisoning by non-domestic gas. For the period 1990-2007, suicide rates based on suicides alone (14.8 per 100,000) would increase by 23, 7 and 1%, respectively, when including deaths of undetermined intent, accidental pesticide poisonings and accidental suffocations. CONCLUSIONS: Suicide rates may be underestimated by more than 30% in Taiwan because some suicides are 'hidden' amongst deaths certified as due to other causes.

Chataut, J., R. K. Adhikari, et al. (2011). "Pattern of organophosphorous poisoning: a retrospective community based study." *Kathmandu Univ Med J (KUMJ)* **9**(34): 31-34.

BACKGROUND: Pesticide poisoning is very common in Nepal. Hospital based studies from various parts of Nepal have shown that poisoning with organophosphorus compounds is the most common type of poisoning. Current study is undertaken to see the pattern of organophosphorus poisoning and to identify the common risk factors among the cases. If the risk factors are modifiable, attempts in addressing the risk factors and decreasing the likelihood of poisoning will certainly be fruitful in reducing the morbidity and mortality associated with organophosphorus poisoning. OBJECTIVES: To assess the risk factors of organophosphorus poisoning which is major public health problem in Nepal. METHODS: A community based retrospective study of 75 cases of organophosphate poisoning who were brought to the emergency department of Dhulikhel hospital over the period of 3 years. Basic information was collected from hospital records and home visits were made to study the risk factors. Data were collected through interviews of the study population and their family members using a pre-designed questionnaire. RESULTS: In this study 75 cases and their families were interviewed of which there were 59% males and 42% females (M/F ratio of 1:1.4). The majority (40%) of the poisoning cases were in the age group 25-34 years. Lower literacy level showed positive association with the incidence of poisoning. Occupation wise vast majority (80%) of the cases were engaged in agricultural work. Suicidal attempts by ingesting organophosphate compounds were high in farmers and females. CONCLUSION: In this study, majority of the poisoning were attempts of intentional self harm. Agriculture workers and females are high risk groups and may be associated with the fact that they have easy access to the

poison. Interventions directed towards health education, counseling, and enforcement of laws restricting the availability and use of harmful pesticides may help in reducing such events in future.

Chen, S. Y., J. Zhou, et al. (2004). "[A survey of emergency treatment of pesticides poisoning in comprehensive hospitals]." Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi **22**(5): 364-367.

OBJECTIVE: To seek the characteristics of pesticide poisoning in emergency departments. METHODS: Twenty-five hospitals were selected. Among them, they were 14 province or city level and 11 county level. The object of study was the patients with pesticide poisoning who were first visit to a doctor (including transfer to the above emergency departments of hospitals) from July 1, 2001 to June 30, 2002. RESULTS: There were 2 261 cases of pesticide poisoning that ranked third place of total acute poisoning cases at the same period. Gender ratio was 1 male to 1.47 female. Among 1 618 patients who first visited to emergency departments (excluding transfer), 43.9% were by emergency ambulance. 68.3% of total cases were caused by intentional exposure to pesticides, of which female accounted for 75.8%. Young people aged 15 to approximately 34 years accounted for 47.5% of all cases. Children (0 to approximately 14 years) also had relatively high pesticide poisoning rates, particularly an accident pesticide poisoning for 1- to approximately 4-year-old children accounted for 65.9% of total acute poisoning in the age group. 98.2% of all cases needed urgent medical treatment, and 52.4% were hospitalized. The leading occupation of patients was farmers followed by housekeepers, students and preschoolers. Insecticides poisoning accounted for 60.1% of all pesticides. The fatality rate in emergency department was 3.9%. 60.8% case was collected from county hospital. Pesticide poisoning rank first place of total acute poisoning cases in county hospital. CONCLUSION: A safety education of Knowledge Attitude Practice (KAP) is an effective measure for preventing pesticide poisoning.

Chen, V. C., A. T. Cheng, et al. (2009). "A community-based study of case fatality proportion among those who carry out suicide acts." Soc Psychiatry Psychiatr Epidemiol **44**(12): 1005-1011.

OBJECTIVE: To investigate the case fatality proportion and associated factors in those carrying out suicide acts in Nantou, Taiwan. METHOD: Data from 1,171 suicide acts (including 973 with deliberate self harm and 198 completed suicides), identified between July 2000 and February 2003, were collected from a population suicide register in Nantou County, Taiwan. Case fatality proportion and the independent effects of demographic factors and suicide method on case fatality were investigated. RESULTS: The overall case fatality proportion was 16.9%, with higher proportions in men (26.3%) and in those aged 65 and over (37.9%). Hanging was the most lethal method (fatality proportion = 81.5%); pesticide was both commonly used and associated with a high case fatality (fatality proportion = 26.3%). Only age (increased with age) and suicide method were found to be independently associated with the risk of fatality. CONCLUSIONS: Suicide method and older age are independent predictors of the fatality of suicide acts. Suicide prevention strategy and clinical assessment ought to take into account of

these two factors. Diminution of pesticide toxicity and control of access to pesticides are important considerations for suicide prevention in rural Taiwan.

Chiu, H. F., S. S. Chan, et al. (2012). "Suicide prevention in the Asia-Pacific region." Asia-Pacific Psychiatry **4** (1): 3-4.

Chowdhury, A. N., S. Banerjee, et al. (2010). "A prospective study of suicidal behaviour in Sundarban Delta, West Bengal, India." Natl Med J India **23**(4): 201-205.

**BACKGROUND:** Deliberate self-harm is a challenging public health issue but there is a paucity of data on non-fatal deliberate self-harm in the literature. We aimed to understand the behaviour of deliberate self-harm, both fatal and nonfatal, in a primary care setting. **METHODS:** A year-long prospective study of all admitted patients of deliberate self-harm at 13 block primary health centres of the Sundarban region was done to examine the sociodemographic profile and clinical outcome of suicidal behaviour. Data were collected by using an especially devised deliberate self-harm register. Each subject was administered a 20-item case history sheet by trained medical officers and nursing staff. **RESULTS:** A total of 1614 deliberate self-harm subjects (619 men, 995 women) were admitted during the year, of whom 143 (62 men, 81 women) died. Although women, especially in the younger age groups, constituted the majority of subjects (61.6%), the fatality trend was higher among men than among women (10% v. 8.1%). Poisoning was the commonest (98.4%) method of self-harm, particularly using pesticide. Easy availability of pesticides was a risk factor. Psychosocial stressors, such as conflict with spouse, guardian or in-laws, failed love affairs and economic distress, were the common underlying reasons. The majority of acts of deliberate self-harm (92.6%) were committed inside the home, especially by women. Only a small proportion of subjects had a past or family history of attempt at deliberate self-harm. The overall incidence of fatal and non-fatal deliberate self-harm was 5.98 and 61.51 per 100 000 population, respectively. **CONCLUSION:** Both fatal and non-fatal pesticide-related deliberate self-harm is a major public health issue in the Sundarban region. An intersectoral approach involving primary health, administration and agriculture may help in developing an effective preventive programme to reduce the morbidity and mortality from deliberate self-harm.

Chowdhury, A. N., S. Banerjee, et al. (2013). "Sociocultural context of suicidal behaviour in the sundarban region of India." Psychiatry J **2013**: 486081.

The role of mental illness in nonfatal deliberate self-harm (DSH) is controversial, especially in Asian countries. This prospective study examined the role of psychiatric disorders, underlying social and situational problems, and triggers of DSH in a sample of 89 patients hospitalised in primary care hospitals of the Sundarban Delta, India. Data were collected by using a specially designed DSH register, Explanatory Model Interview Catalogue (EMIC), and clinical interview. Psychiatric diagnosis was made following the DSM-IV guidelines. The majority of subjects were young females (74.2%) and married (65.2%). Most of them (69.7%) were uncertain about their "intention to die," and pesticide poisoning was the commonest method (95.5%). Significant male-female differences were found with respect to

education level, occupation, and venue of the DSH attempt. Typical stressors were conflict with spouse, guardians, or in-laws, extramarital affairs, chronic physical illness, and failed love affairs. The major depressive disorder (14.6%) was the commonest psychiatric diagnosis followed by adjustment disorder (6.7%); however 60.7% of the cases had no psychiatric illness. Stressful life situations coupled with easy access to lethal pesticides stood as the risk factor. The sociocultural dynamics behind suicidal behaviour and community-specific social stressors merit detailed assessment and timely psychosocial intervention. These findings will be helpful to design community-based mental health clinical services and community action in the region.

Chowdhury, A. N., S. Banerjee, et al. (2007). "Pesticide practices and suicide among farmers of the sundarban region in India." Food Nutr Bull **28**(2 Suppl): S381-391.

**BACKGROUND:** Deliberate self-poisoning by ingesting pesticides is a serious health problem among farmers, especially in low- and middle-income countries. Preventing these suicides is a priority for a public mental health agenda. **OBJECTIVE:** To examine the role of pesticide poisoning in suicide and nonfatal deliberate self-harm, and clarify awareness of risks, safe practices concerning storage and use of pesticides, and associated self-injury, both unintentional and intentional, within farmer households of the Sundarban region, India. **METHODS:** Retrospective record review of adult cases of deliberate self-poisoning at the Block Primary Health Centres of 13 Sundarban Blocks was performed to analyze the relative roles of various methods of self-harm and their lethality. Focus group discussions, questionnaires, and in-depth interviews were undertaken in a community study of farmer households to examine pesticide-related views and practices, with particular attention to storage, use, and health impact. **RESULTS:** Pesticide poisoning was the most common method of deliberate self-harm in both men and women. Pesticide storage in most households was unsafe and knowledge was inadequate concerning adverse effects of pesticides on health, crops, and the environment. **CONCLUSIONS:** An intersectoral approach linking the interests of public health, mental health, and agriculture is well suited to serve the collective interests of all three agendas better than each in isolation. Such an approach is needed to reduce morbidity and mortality from unintentional and intentional self-injury in low-income agricultural communities like those of the Sundarban region.

Chowdhury, A. N., S. Banerjee, et al. (2005). "Household survey of suicidal behaviour in a coastal village of Sundarban Region, India." International Medical Journal **12** (4): 275-282.

**Objective:** Deliberate self-poisoning with pesticides is a health problem in many middle and-low-income agricultural countries. The Sundarban region of West Bengal, India is an agrarian area where pesticides are widely used in agriculture. During a previous cultural epidemiological mental health research in the region, the local community expressed concerns about suicidal behaviour, i.e., both non-fatal (referred to as deliberate self-harm or DSH) and fatal (suicide), particularly with pesticides. A programme of community mental health services was developed to combine research, clinical services,

and interventions to study and prevent suicidal behaviour in the region. The present study reports on findings from the pilot survey of a coastal village of the Namkhana block of the Sundarban region. **Materials and Methods:** A household survey (n=214) was conducted in the Laxmipur Abad village of Namkhana block. A survey schedule (Household Information on Insecticide Use and DSH) was designed to elicit any event of suicidal behaviour in the households during the last five years. **Results:** A total of 15 DSH (46.7% male and 53.3% female) and 3 suicides were reported. The mean age of male DSH patients was higher (27.25 + 9.22 years) than their female (21.71 + 5.55 years) counterparts. Pesticides were the most common agent used in self-harm by both, male DSH (42.9%) and suicide (66.7%) patients. Hanging was more frequently reported among women DSH patients (50%). Family quarrel was implicated as the reason in most of the DSH attempts (71.4% male, 50% females) and suicides (66.7%). The rates for DSH and suicide for the year 2001 were 728.9/100,000 and 355.9/100,000 respectively for the Laxmipur Abad village. **Conclusion:** Suicidal behaviour is a serious public health problem in the Sundarban region. Pesticides were the most common agent used for self-harm. A joint activity involving health service and local agriculture sector should address a DSH prevention programme. Community psychosocial intervention and farmers' education on safe pesticide practices is most suitable approach for reducing morbidity and mortality of self-harm particularly with pesticides in the region. 2005 Japan International Cultural Exchange Foundation.

Chowdhury, A. N., A. Brahma, et al. (2009). "Deliberate self-harm prevention in the Sundarbans region need immediate public health attention." *J Indian Med Assoc* **107**(2): 88, 90, 92-83.

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.

Chowdhury, A. N., A. Brahma, et al. (2009). "Pattern of domestic violence amongst non-fatal deliberate self-harm attempters: A study from primary care of West Bengal." *Indian J Psychiatry* **51**(2): 96-100.

**OBJECTIVE:** Evaluation of various clinico-demographic variables and pattern of domestic violence in non-fatal deliberate self-harm (DSH) attempters

admitted in 3 Block Primary Health Centers (BPHC) of Sundarban region of West Bengal, India in the year 2002. MATERIALS AND METHODS: A prospective study of 89 DSH cases admitted at 3 Sundarban BPHCs by using a specially designed DSH register and a questionnaire on domestic violence in Bengali along with detail clinical interview. RESULTS: Among the total of 89 DSH cases (23 male and 66 female), young (less than 30 years), female sex, low education and married status constituted major part of the sample. Pesticide poisoning was the commonest mode of DSH attempt. Typical stressors found were marital conflict or conflict with in-laws or guardian. A majority of DSH attempters (69.6%) experienced more than one form of domestic violence. Poverty and unemployment in the family were strongly associated with domestic violence. Among female DSH attempters, the most common perpetrator was husband (48.48%) followed by in-laws (16.67%) and parent (34.78%) was the most common perpetrator among males. CONCLUSION: Both DSH and domestic violence are serious socio-clinical issue of a major public health concern in the Sundarban region. Stressful life situations and various types of victimizations in the family intermixed with easy availability of lethal pesticides in this agriculture dependent community may facilitate the impulse of self-harm behavior, especially among the young housewives. Timely psychosocial intervention through community psychiatry program may mitigate the impact of psycho-cultural stressors and thus may help to reduce the morbidity and mortality from DSH.

Chowdhury, A. N., D. Sanyal, et al. (2003). "Deliberate self-harm by ingestion of poisons on Sagar Island in the Sundarban Delta, India." International Medical Journal **10 (2)**: 85-91.

Objective: Reducing suicide rates by preventing deliberate self-harm is a major concern for community-based mental health policy and programmes. Deliberate self-harm (DSH) by ingestion of pesticides is a frequent phenomenon in agricultural communities. This study examined patterns of morbidity and mortality over a five-year period (1995-1999) associated with DSH and their geographical distribution in Sagar Island of the Sundarban region of West Bengal, India. This study seeks to examine the relationship between DSH and availability of pesticide. Materials and Methods: Retrospective and prospective DSH data collection from the indoor admissions of a rural hospital of Sagar Island. Results: During this period there were a total of 488 cases (180 male and 308 female) of deliberate self-harm by ingestion of toxic substances ascertained from hospital admissions to the Sagar Rural Hospital, Rudranagar, where all such admissions on the island are treated. Among these, 16 males and 48 females died, indicating a higher fatality rate for women (15.6% compared with 8.9%). Demographic features and characteristic familial and other social stressors were also studied. DSH was found to be more frequent in areas where betel leaf vine is the predominant cash crop. Young females were the most frequent demographic group by age and sex to present for treatment of DSH in the government health clinics. Typical stressors included family quarrels, marital discord, dowry-related conflict, and broken love affairs. Conclusion: DSH by agrochemical poisoning is a serious public health issue in the Sundarban islands. Proper attention is called for to how recognition of



ecological factors and typical social stressors may indicate ways of reducing morbidity and mortality from DSH in the context of a community mental health programme.

Chuang, C. C., S. T. Wang, et al. (1998). "Clinical experience with pendimethalin (STOMP) poisoning in Taiwan." *Vet Hum Toxicol* **40**(3): 149-150.

The herbicide pendimethalin (STOMP) shares a similar chemical structure with nitro compounds such as dinitrobenzene, which was previously demonstrated to cause methemoglobinemia in mammals. However, reports on STOMP poisoning in humans are rare. We reviewed 71 STOMP poisoning cases (42 men and 29 women of mean age 43.9 +/- 2.5 y) reported to the Poison Control Center--Taiwan from September 1986 to September 1997 and summarized their clinical manifestations. Two incidences resulted from skin and eye contact. The rest were due to oral ingestion intentionally or accidentally. The average ingestion was 106.1 +/- 13.4 ml. Among them, 20 cases had no symptoms or signs, 38 had mild effects such as nausea, vomiting and sore throat, 7 had effects such as severe retching, hematemesis and seizures. Four patients expired due to also taking other herbicides (mainly organophosphates) and because of inadequate airway management. Adequate ventilation support was the major therapy in salvaging the poisoning cases.

Churi, S., M. Ramesh, et al. (2012). "Prospective assessment of patterns, severity and clinical outcome of Indian poisoning incidents." *Chem Pharm Bull (Tokyo)* **60**(7): 859-864.

The objective of this study was to assess the patterns, severity and clinical outcome of poisoning incidents. A prospective assessment was conducted over a period of 1 year in tertiary-care teaching hospitals. Glasgow coma scale (GCS), poisoning severity score (PSS), and snake bite severity score (SSS) were used to predict the severity of poisoning, and then compared to the clinical outcome. The study involved 212 patients with a mean age of 26.7 +/- 12.7 years. Pesticides were found to be the most common poisoning agents. The incidents of intentional poisoning (n=178) were higher than accidental (n=34) poisoning. Poisoning incidents were higher in male population (n=132) compared to female population (n=80). The poisoning incidents were predominantly higher among literates (n=155). The poisoning incidents were higher in rural areas (n=129), followed by urban (n=53) and semi-urban (n=30) areas. The poisoning incidents were highest in the middle class population (n=108), followed by poor class (n=101) and rich class (n=3) population. A majority of patients whose severity of illness was predicted to be mild to moderate recovered from the poisoning. In contrast, patients whose illness was predicted to be severe were either discharged with severe morbidity or deceased. There was a moderate correlation between GCS and PSS scoring systems (r=0.51, p<0.001).

Churi, S., C. Sri Harsha, et al. (2012). "Patterns of poison information queries received by a newly established South Indian poison information center." *Asian Journal of Pharmaceutical and Clinical Research* **5** (SUPPL 2): 79-82.

The newly established Poison information centre (PIC) at Department of Clinical Pharmacy, JSS College of Pharmacy, located at JSS Medical college

hospital, Mysore, Karnataka, India provides poison information services to healthcare professionals and general public. The PIC is effectively functioning since September 2010. The prospective study was conducted over a period of one year to assess the patterns of poison information queries received by PIC. A total of 348 poison information queries were received and answered during the study period. Of the total queries received, majority of queries were from doctors (75.5%) followed by health care professionals and public. Majority of the queries (82.2%) were received from healthcare facilities. A total of 34.5% queries were related to know the management of poisoning. Most of the queries were for better patient care (74.1%) and the information was provided verbally for majority of the queries (72.4%). For most of the poisoning queries (62.9%) the information was provided immediately. Significantly ( $p < 0.001$ ) majority of queries asked were related to intentional (suicidal) poisoning (66.5%) followed by accidental (23.2%) and environmental poisoning (5.8%). Majority of queries were related to poisoning from pesticides (44%) followed by medicines (26.1%), household products (15.8%) and bites and stings (10.1%). Intentional poisoning was most common in adolescents and adults ( $n=241$ ; 69.2%) whereas accidental poisoning was the common in paediatric (0-12 years) population ( $n=56$ ; 16.0%) which attained statistical significance ( $p < 0.001$ ).

Conner, K. R., M. R. Phillips, et al. (2005). "Low-planned suicides in China." Psychological Medicine **35** (8): 1197-1204.

Background. Acts of suicide differ widely in the amount of planning preceding the act. Correlates of completed suicide in China identified in a previous investigation were re-examined to identify those that may be especially relevant to low-planned (impulsive) and high-planned suicidal behavior. The association of planning and method in completed suicide was also assessed. Method. A psychological autopsy study of 505 suicide decedents aged > 18 years sampled to be representative of suicides in China was conducted. Multinomial regression analyses compared three levels of suicide planning (low, intermediate, high). Results. Women and younger individuals were more likely to carry out low-planned and inter-mediate-planned than high-planned acts of suicide. Greater acute stress distinguished low-planned from high-planned suicides. Ingestion of pesticides stored in the home was a more commonly employed method in low-planned than high-planned suicides. Conclusions. Low-planned suicides are more common in women, in younger individuals, and among those who are experiencing acute stress. Prevention strategies targeted at restricting access to pesticides may preferentially lower the rate of low-planned suicides. 2005 Cambridge University Press.

Dalman, C., T. C. Le, et al. (2010). "Suicide attempt in a rural area of Vietnam: Incidence, methods used and access to mental health care." International Journal of Mental Health Systems **4**(3).

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 Ltd.

Dawson, A. H., M. Eddleston, et al. (2010). "Acute human lethal toxicity of agricultural pesticides: a prospective cohort study." *PLoS Med* 7(10): e1000357.

BACKGROUND: agricultural pesticide poisoning is a major public health problem in the developing world, killing at least 250,000-370,000 people each year. Targeted pesticide restrictions in Sri Lanka over the last 20 years have reduced pesticide deaths by 50% without decreasing agricultural output. However, regulatory decisions have thus far not been based on the human toxicity of formulated agricultural pesticides but on the surrogate of rat toxicity using pure unformulated pesticides. We aimed to determine the relative human toxicity of formulated agricultural pesticides to improve the effectiveness of regulatory policy. METHODS AND FINDINGS: we examined the case fatality of different agricultural pesticides in a prospective cohort of patients presenting with pesticide self-poisoning to two clinical trial centers from April 2002 to November 2008. Identification of the pesticide ingested was based on history or positive identification of the container. A single pesticide was ingested by 9,302 patients. A specific pesticide was identified in 7,461 patients; 1,841 ingested an unknown pesticide. In a subset of 808 patients, the history of ingestion was confirmed by laboratory analysis in 95% of patients. There was a large variation in case fatality between pesticides-from 0% to 42%. This marked variation in lethality was observed for compounds within the same chemical and/or WHO toxicity classification of pesticides and for those used for similar agricultural indications. CONCLUSION: the human data provided toxicity rankings for some pesticides that contrasted strongly with the WHO toxicity classification based on rat toxicity. Basing regulation on human toxicity will make pesticide poisoning less hazardous, preventing hundreds of thousands of deaths globally without compromising agricultural needs. Ongoing monitoring of patterns of use and clinical toxicity for new pesticides is needed to identify highly toxic pesticides in a timely manner.

De Alwis, L. B. L. and M. S. L. Salgado (1988). "Agrochemical poisoning in Sri Lanka." Forensic Science International **36 (1-2)**: 81-89.

Mortality resulting from agrochemicals met within the Office of the Judicial Medical Officer, Colombo, which is the premier Medico-legal Institute in Sri Lanka, are analysed over a 3-year period and the morbidity and mortality rates of the entire country are examined over a 10-year period. The number of patients admitted to hospitals in Sri Lanka during the period 1975-1983, stood at around 11,000-15,000 each year, with the year 1983 recording 16,649 admissions. The number of deaths during the same period varied from 900 to 1500 each year, while the year 1983 recording 1521 deaths. About 75% of such cases of poisoning were due to self ingestion while accidental and occupational poisoning formed the balance. Principal agricultural districts like Kurunegala, Jaffna, Vavuniya, Nuwara-Eliya and Badulla recorded the highest incidence of poisoning. The mortality figures of the Office of the J.M.O., Colombo, indicated that 4% of all bodies subjected to autopsy were those of agrochemical poisoning. The male/female ratio was 2:1. Seventy-five percent of deaths from agrochemical poisoning were recorded in the 15-39 year age group, while 33% of deaths belonged to the 20-24 age group. One third of cases of agrochemical poisoning were dead on being brought to hospital, while 50% were dead within 2 h and 60% dead within 24 h. Organophosphates accounted for 57.6% of all cases of agrochemical poisoning, while paraquat accounted for 21.2% of cases. Deaths were also reported from what are called safe chemicals like Carbamates and Pyrethrums due to their lethal additives.

de Silva, V. A., S. M. Senanayake, et al. (2012). "From pesticides to medicinal drugs: time series analyses of methods of self-harm in Sri Lanka." Bull World Health Organ **90(1)**: 40-46.

**OBJECTIVE:** To explore if recent changes in methods of self-harm in Sri Lanka could explain the decline in the incidence of suicide. **METHODS:** Time series analyses of suicide rates and hospitalization due to different types of poisoning were carried out. **FINDINGS:** Between 1996 and 2008 the annual incidence of hospital admission resulting from poisoning by medicinal or biological substances increased exponentially, from 48.2 to 115.4 admissions per 100,000 population. Over the same period, annual admissions resulting from poisoning with pesticides decreased from 105.1 to 88.9 per 100,000. The annual incidence of suicide decreased exponentially, from a peak of 47.0 per 100,000 in 1995 to 19.6 per 100,000 in 2009. Poisoning accounted for 37.4 suicides per 100,000 population in 1995 but only 11.2 suicides per 100,000 in 2009. The case fatality rate for pesticide poisoning decreased linearly, from 11.0 deaths per 100 cases admitted to hospital in 1997 to 5.1 per 100 in 2008. **CONCLUSION:** Since the mid 1990s, a trend away from the misuse of pesticides (despite no reduction in pesticide availability) and towards increased use of medicinal and other substances has been seen in Sri Lanka among those seeking self-harm. These trends and a reduction in mortality among those suffering pesticide poisoning have resulted in an overall reduction in the national incidence of accomplished suicide.

Eddleston, M. (2013). "Applied clinical pharmacology and public health in rural Asia--preventing deaths from organophosphorus pesticide and yellow oleander poisoning." *Br J Clin Pharmacol* **75**(5): 1175-1188.

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.

Eddleston, M., S. Adhikari, et al. (2012). "Effects of a provincial ban of two toxic 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. and D. Gunnell (2006). "Why suicide rates are high in China [3]." *Science* **311** (5768): 1711-1713.

Eddleston, M., D. Gunnell, et al. (2005). "Epidemiology of intentional self-poisoning in rural Sri Lanka." *Br J Psychiatry* **187**: 583-584.

We investigated the epidemiology of intentional self-poisoning in rural Sri Lanka by prospectively recording 2189 admissions to two secondary hospitals. Many patients were young (median age 25 years), male (57%) and used pesticides (49%). Of the 198 who died, 156 were men (case fatality 12.4%) and 42 were women (4.5%). Over half of female deaths were in those under 25 years old; male deaths were spread more evenly across age groups. Oleander and paraquat caused 74% of deaths in people under 25 years old; thereafter organophosphorous pesticides caused many deaths. Although the age pattern of self-poisoning was similar to that of industrialised countries, case fatality was more than 15 times higher and the pattern of fatal self-poisoning different.

Eddleston, M., M. H. Rezvi Sheriff, et al. (1998). "Deliberate self harm in Sri Lanka: An overlooked tragedy in the developing world." *British Medical Journal* **317 (7151)**: 133-135.

Eddleston, M., K. Sudarshan, et al. (2006). "Patterns of hospital transfer for self-poisoned patients in rural Sri Lanka: implications for estimating the incidence of self-poisoning in the developing world." *Bull World Health Organ* **84(4)**: 276-282.

OBJECTIVES: Most data on self-poisoning in rural Asia have come from secondary hospitals. We aimed to: assess how transfers from primary to secondary hospitals affected estimates of case-fatality ratio (CFR); determine whether there was referral bias according to gender or poison; and estimate the annual incidence of all self-poisoning, and of fatal self-poisoning, in a rural developing-world setting. METHODS: Self-poisoning patients admitted to Anuradhapura General Hospital, Sri Lanka, were reviewed on admission from 1 July to 31 December 2002. We audited medical notes of self-poisoning patients admitted to 17 of the 34 surrounding peripheral hospitals for the same period. FINDINGS: A total of 742 patients were admitted with self-poisoning to the secondary hospital; 81 died (CFR 10.9%). 483 patients were admitted to 17 surrounding peripheral hospitals. Six patients (1.2%) died in peripheral hospitals, 249 were discharged home, and 228 were transferred to the secondary hospital. There was no effect of gender or age on likelihood of transfer; however, patients who had ingested oleander or paraquat were more likely to be transferred than were patients who had taken organophosphorus pesticides or other poisons. Estimated annual incidences of self-poisoning and fatal self-poisoning were 363 and 27 per 100,000 population, respectively, with an overall CFR of 7.4% (95% confidence interval 6.0-9.0). CONCLUSION: Fifty per cent of patients admitted to peripheral hospitals were discharged home, showing that CFRs based on secondary hospital data are inflated. However, while incidence of self-poisoning is similar to that in England, fatal self-poisoning is three times more common in Sri Lanka than fatal self-harm by all methods in England. Population based data are essential for making international comparisons of case fatality and incidence, and for assessing public health interventions.

Fathelrahman, A. I., A. F. Ab Rahman, et al. (2005). "MS 04-044: demographic features of drug and chemical poisoning in northern Malaysia." Clin Toxicol (Phila) **43**(2): 89-94.

Acute poisoning is a significant health problem all over the world. In Malaysia, nationwide data on poisoning pattern is scarce and incomplete. The objectives of our study were to determine the pattern of acute drug and chemical poisoning at Penang General Hospital (PGH), in the northern region of Malaysia, and to compare poisoning characteristics between different ethnic groups. The study was a retrospective case review of all poisoned patients admitted to PGH during the years 2000-2002. We collected data concerning demographic parameters of patients, information about the agent(s) implicated, and circumstances surrounding the event. There were 493 poisoning incidents. Nearly two-thirds of the poisoned cases involved female patients. The predominant mode of poisoning was intentional (51.5%). The age group 15.1-30 years ranked at the top, constituting 55.2% of all cases. Drugs were the predominant agents implicated. Among cases associated with drugs, paracetamol was the main causative agent (44.7%). Chinese patients constituted 37.7% of all poisoning cases, followed by the Indians (31.6%) and Malays (26.6%). Between ethnic groups, Indian patients were found to have the highest rate of poisoning admission of 75.2 per 100,000 persons.

Fathelrahman, A. I., A. F. Ab Rahman, et al. (2008). "Self-poisoning by drugs and chemicals: variations in demographics, associated factors and final outcomes." Gen Hosp Psychiatry **30**(5): 467-470.

OBJECTIVE: Drug overdose exposures were compared with chemical poisoning in terms of demographics, associated factors and final outcomes. METHOD: Deliberate self-poisoning (DSP) cases admitted to Penang General Hospital during the years 2000-2004 were studied. Chi-square, independent t-test and binary logistic were used whenever applicable. RESULTS: Indian patients were more likely to use household products, whereas Malay and Chinese patients were more likely to take drug overdoses ( $P=.001$ ). Drug overdose victims experienced more socioeconomic problems ( $P=.05$ ) and were more likely to be admitted to the intensive care unit ( $P=.052$ ). Chemical poisoning patients presented earlier ( $P=.011$ ), were hospitalized for shorter time ( $P=.001$ ) and had a higher rate of mortality ( $P=.01$ ). CONCLUSION: The present study has identified a unique ethnic variation in the choice of suicide attempts from toxic substances. DSP associated with drug overdose showed significant morbidity, but increased mortality was seen in chemical poisoning.

Fernando, R. (1990). "National Poisons Information Centre in a developing Asian country - The first year's experience." Human and Experimental Toxicology **9** (3): 161-163.

The National Poisons Information Centre (NPIC) in Sri Lanka was established in January 1988. It received 353 enquiries in the first year of which 37% concerned pesticide poisoning. More than half the instances were of self-poisoning; consistent with the high suicide rate in the island. Over a quarter of poisoning episodes were among 19-25 year olds. Follow-up of enquiries showed 31 (9%) deaths. Collaboration with developed countries

helped in the formation of the NPIC, fulfilling a long felt need among doctors in the island.

Fernando, R., M. Hewagama, et al. (2010). "Study of suicides reported to the Coroner in Colombo, Sri Lanka." *Med Sci Law* **50**(1): 25-28.

**INTRODUCTION:** Deaths from suicide reached a peak in Sri Lanka in 1995. Several interventions reduced the suicide rate of 48.7 per 100,000 in 1995 to 23 per 100,000 in 2006, though it is still a major socioeconomic problem. All suicides have to be reported to the Inquirer of Sudden Death (ISD) or 'Coroner', according to the Criminal Procedure Code. **METHOD:** All deaths where a verdict of 'suicide' was given after an inquest at the Coroner's Court, Colombo, in 2006 were studied. Close relations or friends who attended the inquest were interviewed by medically qualified research assistants. Age, sex, marital and occupational status, level of education, living circumstances and method and reasons for the suicide were studied. **RESULTS:** During 2006, 151 deaths from suicide were documented, of which 93 (62%) were men. The majority (47%) were aged between 20 and 29 years. One-third of the victims was unemployed. At the time of committing suicide, 75% were living with family; 89 (59%) were married and 46 (31%) were single. Poisoning was the cause of death in 66 (44%), 48 (70%) of which were due to pesticides. Burns caused 51 (34%) deaths. Other common causes of death included hanging (11%), jumping in front of a train (7%) and drowning (3%). The commonest reason for suicide was dispute with the spouse/marital disharmony (30%). Other reasons were dispute with parents (8%), financial matters (7%), organic diseases (7%), alcoholism (7%), psychiatric illnesses (6%) and disputes in love affairs (5%). In 29 cases (19%), no definite reason for the suicide was evident. **DISCUSSION:** Self-poisoning and self-immolation were the commonest methods used to commit suicide. Marital disharmony was the main reason (30%). Psychiatric illnesses were responsible for only 6%. Future interventional activities should include secure access and restriction of the availability of pesticides and drugs, empowering people to manage anger and conflicts, and recognition and treatment of alcoholism and psychiatric illnesses. The success story of the reduction in the incidence of suicides in Sri Lanka should be a lesson to many developing countries where suicide is a major socioeconomic and health issue.

Ganesvaran, T., S. Subramaniam, et al. (1984). "Suicide in a Northern town of Sri Lanka." *Acta Psychiatrica Scandinavica* **69** (5): 420-425.

Suicide mortality in a Northern town of Sri Lanka for the year 1982 is examined. The rate was 52.5 per 100,000 general population and shows an increasing trend amongst the 15-34 age group. The commonest method was self-poisoning by agrochemicals and insecticides of organophosphorus type. Psychiatric diagnosis, social, economic and political factors are presented. Easy availability of dangerous agrochemicals and rapid social and political changes appear to be of equal importance in producing a high rate of suicide.

Gunnell, D., R. Fernando, et al. (2007). "The impact of pesticide regulations on suicide in Sri Lanka." *Int J Epidemiol* **36**(6): 1235-1242.

**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 time trends in suicide and risk factors for suicide in Sri Lanka, 1975-2005. **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.

Gupta, P., H. Gouda, et al. (2010). "Profile of poisoning cases in north Karnataka." Medico-Legal Update **10 (2)**: 61-63.

All around the world, acute poisoning remain a major cause of hospital admission<sup>1</sup>. The wide availability and easy accessibility to potentially toxic chemicals (which have wide spread use in medicine, industry, agriculture and even in normal daily life) contribute to the ease with which the lay public can get their hands on lethal poisons<sup>2</sup>. Poisoning has been used by man for murder and suicide as long as recording history, several modes of exposure may be recognized context with poisoning namely: i) accidental and suicidal poisoning which cannot be prevented through legislation or preaching ii) occupation exposure iii) by standing exposure resulting from off target drift iv) general public exposure who consume item containing pesticides residues<sup>3</sup>. Incidence of poisoning, as reported is 13-fold higher in developing countries than in highly industrialized nation. 300,000 people die each year from pesticide self poisoning in the rural developing world<sup>4</sup>. This is a pilot study conducted at Belgaum, North Karnataka to make preliminary assessment about poisoning cases etiologies. The aim of the study was finding out the common age group involved and mode of poisoning. Besides this it also attempts to relate with gender and their choice. The common age group involved is in between 21 to 30 years. Males are more likely affected by poisoning (53%) compared to female (47%). This study serves as pilot project for more detailed retrospective and prospective studies in the future.

Gupta, S. K., S. S. Peshin, et al. (2003). "A study of childhood poisoning at National Poisons Information Centre, All India Institute of Medical Sciences, New Delhi." J Occup Health **45(3)**: 191-196.

A retrospective analysis of the poisoning calls received by the National Poisons Information Centre (NPIC) showed a total of 2,720 calls during a period of three years (April 1999-March 2002). Poisoning in children was reported in 995 calls (36.6%). The age ranged from less than 1 yr to 18 yr and the age groups involved were divided into four categories (0-6 yr, >6-12 yr, >12-16 yr, >16-18 yr). The most vulnerable age group included children

from less than one year to 6 yr old. Males outnumbered females (M=628, F=367). Although the accidental mode was the commonest (79.7%), intentional attempts were also noticed (20.2%) in the >12-16 yr and >16-18 yr age groups. In the majority of cases, the route was oral (96.8%) followed by dermal exposure (3.2%) comprising bites and stings. Various types of agents belonged to classes of household products (47.0%), drugs (21.8%), industrial chemicals (7.9%), agricultural pesticides (9.1%), bites and stings (3.2%), plants (1.5%), miscellaneous products (5.3%) and unknown products (4.0%). The incidence of poisoning was highest due to household products comprising mainly pyrethroids, para/thermometer mercury, rodenticides, phenyl, detergents and corrosives, etc. Poisoning due to drugs mainly included anticonvulsants, thyroid hormones, benzodiazepines, analgesics and oral contraceptives. Among the agricultural pesticides aluminium phosphide was the most commonly consumed, followed by organochlorines and organophosphates, etc. Paint thinners were common among industrial chemicals. Bites and stings were mainly snake bites and scorpion stings. Poisoning due to plants was low and *Datura* was commonly ingested. Although these data may not give an exact picture of the incidence rate in our country, due to underreporting of calls to the Centre and because the actual incidence might be higher or even variable, but they do give the trend in India, indicating that a strong emphasis should be placed on a prevention campaign which can at least reduce the occurrence of accidental pediatric poisoning.

Hanwella, R., S. M. Senanayake, et al. (2012). "Geographical variation in admissions due to poisoning in Sri Lanka: a time series analysis." *Ceylon Med J* 57(4): 152-158.

**OBJECTIVES:** To carry out time series analyses of hospital admissions for poisoning between 1995-2008 in all districts in Sri Lanka to identify trends and geographical variations in the substances used in poisoning. **METHODS:** Data of hospital admissions from 1995-2008 due to poisoning were obtained from the Annual Health Bulletins published by the Ministry of Health. Data were converted to annual rates per 100,000 population. Time trends in the rates of suicide and self-poisoning were calculated using univariate time series analysis. **RESULTS:** All districts except Kilinochchi and Mullaitivu showed an increase in the rates of admissions due to poisoning with drugs, medicaments and biological substances. Colombo, Hambantota, Kalutara and Anuradhapura showed an exponential increase. Hambantota, Monaragala, Nuwara Eliya and Colombo show an increase in the rate of admissions after pesticide poisoning. All other districts showed a linear decrease. Admissions due to all types of poisoning showed a negative trend in Anuradhapura, Polonnaruwa, Ampara, Matale and Batticaloa districts. Other districts show a positive trend in the rate of admissions for all types of poisoning. **CONCLUSIONS:** Results should be viewed with caution because they are based on analysis of secondary data. Although the rate of suicides has reduced since 1995, admissions due to self poisoning have increased in almost all districts. While pesticide poisoning is becoming less, there is a gradual shift to the use of drugs and medicaments in self poisoning. Poisoning with drugs, medicaments and biological substances are increasing both in urban and rural areas.

Hawton, K., L. Ratnayake, et al. (2009). "Evaluation of acceptability and use of lockable storage devices for pesticides in Sri Lanka that might assist in prevention of self-poisoning." BMC Public Health **9**: 69.

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.

Hung, H. T., J. Hojer, et al. (2010). "Potentially hazardous environmental factors for poisoning in rural Vietnam: a community-based survey." Southeast Asian J Trop Med Public Health **41**(4): 1021-1027.

Poisoning represents one of the most common threats against public health. This population-based study was undertaken to identify potentially hazardous environmental factors for poisoning in Vietnam, and thereby to improve the background information needed to take adequate preventive measures. The study population comprised 3814 individuals from 942 randomly selected households in Phu Tho Province. Their mean age was 32.7 years, 50.4% were male. Data collection methods included face-to-face interviews using a structured questionnaire, and reality observations following a structured checklist. Of the study population, 438 individuals (11.5%) recalled having suffered from at least one episode of symptomatic poisoning. The toxic agents most commonly involved in these incidents were pesticides (68.7%).

Hazardous exposure to toxins was reported to occur frequently and pesticides were again the agents most commonly involved. The presence of insecticides and other pesticides in the home were common (39%) and 21.7% of studied households kept poisonous chemicals in places easily accessible to children. Nearly half the households kept medications at home, often without any medical safe-box. Fifty-six point two percent reported prescriptions were not necessary for purchasing pharmaceuticals. Common habits among household members put them at risk for poisoning by natural toxins. Among these, frequent use of unusual herbs, and the practice of raising and eating poisonous animals were most important. In conclusion, the widespread use of pesticides, risk for exposure to natural toxins and self medication constitute major hazards for poisoning in Vietnam. Effective control regulations and safe strategies are lacking.

Hwang, K. Y., E. Y. Lee, et al. (2002). "Paraquat intoxication in Korea." Arch Environ Health **57**(2): 162-166.

In this study, the authors explored acute paraquat intoxication and determined potential factors related to paraquat fatalities. During 1999, 154 patients with paraquat intoxication were admitted to the Institute of Pesticide Poisoning at the Soonchunhyang University Chunan Hospital. The authors assessed paraquat exposure by quantifying the amount of ingested paraquat and by semiquantitative assay of paraquat in urine. Outcomes of paraquat intoxication were categorized as recovery or death. Among all the patients, 139 (90.3%) were transferred from other medical facilities to the Institute of Pesticide Poisoning following a mean exposure time of 20.1 hr (standard deviation = 2.6 hr). Intentional ingestion of paraquat accounted for 73.4% (113/154 patients) of all paraquat poisonings, and it represented a significantly higher fatality rate (53.2%) than did accidental ingestion (19.1% [ $p < .001$ ]). The overall paraquat fatality was 43.8%. Multiple logistic-regression analysis revealed that the risk of fatality increased significantly with (1) the quantity of paraquat ingested and (2) a positive urinary paraquat test. The results indicated that paraquat is potentially lethal in humans, and the risk of fatality is directly related to the amount ingested and absorbed.

Jayasinghe, N. R. M. and J. H. Foster (2011). "Deliberate Self-Harm/Poisoning, Suicide Trends. The Link to Increased Alcohol Consumption in Sri Lanka." Archives of Suicide Research **15**(3): 223-237.

Sri Lanka has witnessed a fall in suicide rates in the period 1991 to 2010, however the incidence of self-harm remains high. Over the same period alcohol consumption has increased for both alcohol that is purchased legally and distilled privately. This paper investigates a number of secondary data sets from such bodies as the Department of Police, Registrar General's Office for Statistics, Ministry of Health and Nutrition, National Poisons Information Center and Lanka Library Forum to shed light on the link between suicide/self-harm and rising alcohol consumption. The authors conclude that there is a strong association between alcohol consumption and suicide/poisoning/deliberate self-harm in Sri Lanka and propose a number of research priorities.

Jesslin, J., R. Adepu, et al. (2010). "Assessment of prevalence and mortality incidences due to poisoning in a South Indian tertiary care teaching hospital." Indian J Pharm Sci **72**(5): 587-591.

WHO reports estimate poisoning as one of the most common causes of increased morbidity and mortality rate world-wide. Various agents such as pesticides, drugs have been used for intentional and accidental poisoning in different countries. In the Indian scenario, pesticides are the most commonly used poisoning agents. To assess the prevalence and mortality incidence rate due to various poisoning agents a retrospective and prospective study conducted over a period of nine months in a tertiary care teaching hospital. Retrospective data of poisoning cases was collected from the medical records section and the prospective data of poisoning cases was collected from the emergency and causality departments. A total of 1045 poisoning related admissions were identified during the period January 2005 to September 2008. Among them, 68.40% of cases were due to intentional poisoning and 31.60% were due to accidental poisoning. Of the poisoning related admissions, 84.4% of patients recovered, whereas in 7.6% of cases condition did not improve. Mortality rate was observed 4%. Intentional poisoning was observed more in male population (60.2%) in the age group of 18-29 years. Accidental poisoning was seen more in children in the age group of 1-3 years. Incidence of overall poisoning cases were high due to pesticides (39.5%) followed by medicines (26.1%), household products (22.1%), environmental poisoning (12.1%) and heavy metals (0.2%). It was observed that availability of centralised poison information centre and treatment protocols will improvise poison management practices in tertiary care hospitals by the clinicians.

Jiang, W., C. M. Wu, et al. (2010). "[Analysis of poisoning cases from Chinese National Injury Surveillance System, 2006 - 2008]." Zhonghua Liu Xing Bing Xue Za Zhi **31**(9): 1009-1012.

OBJECTIVE: To study the preventive strategies through analyzing the poisoning cases from the National Injury Surveillance System (NISS), from 2006 to 2008. METHODS: Data of poisoning cases was descriptively analyzed from Chinese NISS, from 2006 to 2008. RESULTS: The proportion of poisoning cases to all injuries cases from NISS were 2.57%, 2.48% and 2.52% from 2006 to 2008, which ranked sixth in all the injuries causes. Most people being poisoned had junior middle school education and most of them were agriculture/animal husbandry/fishery/water producers or commercial service personnel. Most of the poisoning incidents were happened at home, always occurred in leisure time - around 8 PM, every day. The common types of poisoning were alcohol, clinical drugs, pesticide and carbon monoxide. Unintentional injuries were the main causes. Self-harm/suicidal cases in the rural areas were more than in the urban areas, with women more than men. The main type of self-harm/suicide related poisoning cases were through drugs or pesticide.  $\geq 65$ , 15 - 29 and 30 - 44 year-olds were most commonly seen. CONCLUSION: Alcoholism was the primary type of poisoning injuries which is the highest in young adults (15 - 29 years and 30 - 44 years). It's important to promote civilized drinking habits and limit access to alcohol for youth. Self-harm/suicide had close relationship with clinical drugs and pesticide. The key points to prevent pesticide and clinical drugs

poisoning were safe storage of pesticides, universal security of pesticide, and the supervision on drug producing and marketing. Children and the elderly were the high risk people for carbon monoxide poisoning. Monitoring and intervention must be strengthened.

Karalliedde, L. and N. Senanayaka (1988). "Acute organophosphorus insecticide poisoning in Sri Lanka." *Forensic Science International* **36 (1-2)**: 97-100.

Records of 92 cases of acute organophosphorus (OP) insecticide poisoning were analysed. Of the patients 91% were under 30 years of age and 86% were males. The common agents were Dimethoate, Methamidophos, Malathion, Monocrotophos and Fenthion. Poisoning was due to ingestion with suicidal intent in the majority. In addition to the acute cholinergic features, the other important manifestations were delayed onset respiratory paralysis and delayed polyneuropathy. The overall mortality was 18%.

Kim, H. J., E. S. Cha, et al. (2012). "Pesticide poisonings in South Korea: findings from the National Hospital Discharge Survey 2004-2006." *Hum Exp Toxicol* **31(8)**: 751-758.

**OBJECTIVES:** Pesticide poisoning stands as a major public health issue worldwide. The objective of this study was to examine the epidemiologic characteristics of pesticide-related hospitalizations in South Korea.  
**METHODS:** Data from the Korea National Hospital Discharge Survey were analyzed to describe the epidemiologic characteristics of pesticide poisoning among hospitalized patients from 2004 through 2006. Pesticide-related hospitalizations were identified using the International Classification of Diseases, Tenth Revision codes. National estimates of pesticide-related hospitalizations were calculated using sampling weights for number of hospitalizations. **RESULTS:** A total of 25,982 pesticide-related hospitalizations were estimated during the years 2004-2006, yielding an average annual pesticide-related hospitalization rate of 17.8 per 100,000 population in South Korea. Age-specific rates for pesticide-related hospitalization increased with age, with the highest rate noted among those aged 70 or above. The majority of pesticide-related hospitalization was cases of intentional poisoning in rural areas. Seasonal variation in the rate was observed, with summer being the highest among both men and women. **CONCLUSIONS:** Pesticide-related hospitalization is prevalent and demonstrates demographic and seasonal and regional variations. More effective strategies to reduce pesticide-related hospitalizations are required in South Korea.

Kim, Y. R., K. H. Choi, et al. (2011). "Elderly suicide attempters by self-poisoning in Korea." *Int Psychogeriatr* **23(6)**: 979-985.

**BACKGROUND:** Suicide is a major public health concern. The elderly have the highest rate of suicide and they make more lethal suicide attempts and have fewer psychiatric interventions than young people. Furthermore, they have old-age specific psychosocial difficulties. The present study investigated psychosocial risk factors and characteristics of an index suicide attempt of the elderly suicide attempters. **METHODS:** Subjects included 388 patients who were admitted to the emergency room following self-poisoning. Two age groups were defined: younger patients (aged less than 65 years)

and older patients (aged over 65 years). Data including demographic factors, suicidal risk factors and information about the current suicide attempt were obtained from a retrospective chart review. RESULTS: The number of suicide attempters over the age of 65 years old was 57, and their mean age was 73.5 +/- 7.5 years. The elderly patients had more underlying medical illnesses than the under-65 group ( $p < 0.001$ ). Depression was the most common psychiatric diagnosis. Psychotropics were the most commonly ingested drugs in both groups, but the use of pesticides was more notable in the elderly. The elderly suicide attempters had higher risk-rating scores ( $p < 0.001$ ) and lower rescue-rating scores ( $p = 0.014$ ) than the under-65 group. Male-to-female ratio of the elderly group was nearly 1:1 unlike the under-65 group ( $p = 0.004$ ). CONCLUSION: Elderly suicide attempters had different psychosocial stressors such as physical illness and more lethal suicide attempts. Our study suggests the need for development of specific preventive strategies and management guidelines for the elderly suicide attempters.

Ko, Y., H. J. Kim, et al. (2012). "Emergency department visits due to pesticide poisoning in South Korea, 2006-2009." *Clin Toxicol (Phila)* **50**(2): 114-119.

OBJECTIVES: The objective of this study is to estimate the numbers and rate of emergency department visits in South Korea that are the result of pesticide poisoning and to describe their epidemiologic characteristics.

MATERIALS AND METHODS: Data collected from the National Emergency Department Information System were used to estimate the number of emergency department visits due to pesticide poisoning in South Korea for the period spanning 2006 through 2009. Emergency department visits for pesticide poisoning were defined by ICD-10 codes (T60.0-T60.9). National estimates and their 95% confidence intervals were calculated per 100 000 population. RESULTS: Among the 65 877 total poisoning-related emergency department visits in the data, 11 985 (18.2%) were emergency department visits resulting from pesticide poisoning. During the study period, the annual average rate of emergency department visits for pesticide poisoning was 26.8 per 100 000 population. Intentional pesticide poisoning (51.4%) was more frequent than unintentional. The fatality rate from intentional pesticide poisoning was also higher than that from unintentional or cases where the intention was unknown. In terms of age-specific rates of emergency department visits for pesticide poisoning, they increased with age, as did the gap between men and women. CONCLUSIONS: This study provide estimates for emergency department visits due to pesticide poisoning at the national level and suggests that pesticide poisonings, both intentional and unintentional, require significant public health interventions in South Korea.

Konradsen, F., W. Hoek, et al. (2006). "Reaching for the bottle of pesticide--a cry for help. Self-inflicted poisonings in Sri Lanka." *Soc Sci Med* **62**(7): 1710-1719.

This long-term study in Sri Lanka explored the complexities behind self-inflicted pesticide poisonings by 166 Sri Lankans. Using or threatening to use pesticides for self-harm has become a response to stressful events and a powerful message towards a specific individual, or to the outside world in general, conveying misgiving, anger, sadness, hopelessness, frustration, or 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.

Konradsen, F., R. Pieris, et al. (2007). "Community uptake of safe storage boxes to reduce self-poisoning from pesticides in rural Sri Lanka." *BMC Public Health* 7: 13.

**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 (46%) 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.

Kumar, S. V., B. Venkateswarlu, et al. (2010). "A study on poisoning cases in a tertiary care hospital." *J Nat Sci Biol Med* 1(1): 35-39.

Acute poisoning with various substance is common everywhere. The earlier the initial resuscitations, gastric decontamination and use of specific antidotes, the better the outcome. The aim of this study was to characterize the poisoning cases admitted to the tertiary care hospital, Warangal district, Andhra Pradesh, Southern India. All cases admitted to the emergency department of the hospital between the months of January and December, 2007, were evaluated retrospectively. We reviewed data obtained from the hospital medical records and included the following factors: socio-demographic characteristics, agents and route of intake and time of admission of the poisoned patients. During the outbreak in 2007, 2,226 patients were admitted to the hospital with different poisonings; the overall case fatality rate was 8.3% (n = 186). More detailed data from 2007 reveals that two-third of the patients were 21-30 years old, 5.12% (n = 114) were male and 3.23% (n = 72) were female, who had intentionally poisoned themselves. In summary, the tertiary care hospitals of the Telangana region, Warangal, indicate that significant opportunities for reducing mortality are achieved by better medical management and further sales restrictions on the most toxic pesticides. This study highlighted the lacunae in the services of tertiary care hospitals and the need to establish a poison information center for the better management and prevention of poisoning cases.

Lee, H. L., H. J. Lin, et al. (2008). "Presentations of patients of poisoning and predictors of poisoning-related fatality: findings from a hospital-based prospective study." *BMC Public Health* 8: 7.

**BACKGROUND:** Poisoning is a significant public health problem worldwide and is one of the most common reasons for visiting emergency departments (EDs), but factors that help to predict overall poisoning-related fatality have rarely been elucidated. Using 1512 subjects from a hospital-based study, we sought to describe the demographic and clinical characteristics of poisoning patients and to identify predictors for poisoning-related fatality. **METHODS:** Between January 2001 and December 2002 we prospectively recruited poisoning patients through the EDs of two medical centers in southwest Taiwan. Interviews were conducted with patients within 24 hours after admission to collect relevant information. We made comparisons between survival and fatality cases, and used logistic regressions to identify predictors of fatality. **RESULTS:** A total of 1512 poisoning cases were recorded at the EDs during the study period, corresponding to an average of 4.2 poisonings per 1000 ED visits. These cases involved 828 women and 684 men with a mean age of 38.8 years, although most patients were between 19 and 50 years old (66.8%), and 29.4% were 19 to 30 years. Drugs were the dominant poisoning agents involved (49.9%), followed by pesticides (14.5%). Of the 1512 patients, 63 fatalities (4.2%) occurred. Paraquat exposure was associated with an extremely high fatality rate (72.1%). The significant predictors for fatality included age over 61 years, insufficient respiration, shock status, abnormal heart rate, abnormal body temperature, suicidal

intent and paraquat exposure. **CONCLUSION:** In addition to well-recognized risk factors for fatality in clinical settings, such as old age and abnormal vital signs, we found that suicidal intent and ingestion of paraquat were significant predictors of poisoning-related fatality. Identification of these predictors may help risk stratification and the development of preventive interventions.

Lee, M. J., H. K. Roh, et al. (2009). "National survey for epidemiology of paraquat poisoning in Korea." **Clinical Toxicology Conference: 2009 North American Congress of Clinical Toxicology Annual Meeting San Antonio, TX United States. Conference Start: 20090921 Conference End: 20090926. Conference Publication: (var.pagings). 47 (7): 740.**

**Objectives:** Paraquat poisoning by ingestion is often fatal. Most paraquat poisoning studies conducted in various countries were retrospective or simple collection of individual reports in prospective studies. Although all these data are not sufficient to understand overall paraquat poisoning, it is helpful to compare epidemiological status between different countries or regions. In this study, we described epidemiologic status of paraquat poisoning in Korea, which was based on national prospective survey entitled 'Research on the actual state of pesticide poisoning in Korea and guidelines for diagnosis and treatment of pesticides poisoning'. **Method:** Research on the actual state of acute pesticide poisoning in Korea was conducted through 38 large hospitals nationwide from August 2005 to July 2006. Outcomes of paraquat intoxication were categorized as recovery or death. **Results:** Total 1,610 patients acutely intoxicated with pesticides. Of the 520 intoxicated patients with paraquat, male was 63.1% and the median age was 54 years. The incidence of paraquat poisoning was high between the ages of 40 and 69, and 98.0% of the poisoning occurred through oral route. Intentional poisoning accounted for 87.9% of paraquat poisoning and the proportion of adults older than 20 years was 99.0%. There was no accidental paraquat poisoning at all in patients less than 20 years old whose median age was 16.5 years. Most frequent clinical manifestations were nausea (32.9%) and vomiting (32.7%), followed by irritability (30.3%), confusion (19.4%), dyspnea (19.4%), sorethroat (17.7%). Overall fatality rate of paraquat was 73.5%. The fatality rates of paraquat poisoning increased with the amount ingested. The paraquat volume <5ml contributed 5.3% to the fatality, >5-10 ml 40.0%, >10-20 ml 51.4%, >20-40 ml 68.3%, >40-60 ml 81.3%, >60-100 ml 92.9%, >100-200 95.1%, and >200 ml 100%. **Conclusion:** The overall paraquat fatality in Korea was 73.5%, which is similar with other countries or regions. The results indicated that paraquat is potentially lethal in humans, and the risk of fatality is directly related to the amount ingested and absorbed.

Lee, W. J., E. S. Cha, et al. (2009). "Deaths from pesticide poisoning in South Korea: trends over 10 years." **Int Arch Occup Environ Health** 82(3): 365-371.

**OBJECTIVES:** Pesticide poisoning is a major cause of death in the world. The objective of this study was to examine the trends of pesticide poisoning deaths and their epidemiologic characteristics in South Korea. **METHODS:** We evaluated the age-standardized mortality rates from pesticide-related deaths (intentional self-poisoning, accidental poisoning, assault, undetermined intent poisoning) in South Korea from 1996 through 2005, using registered death data obtained from the Korea National Statistical

Office. The regional rurality index was calculated and correlation analyses were used to estimate the association with pesticide poisoning mortality. RESULTS: The number of pesticide poisoning deaths from 1996 through 2005 was 25,360, which accounted for 58.3% of the total poisoning fatalities. The age-standardized mortality rates by pesticide poisoning significantly increased from 4.42 to 6.42 per 100,000 population, whereas the total death rate was decreased in the same period. Intentional self-poisoning was the majority cause of death from pesticides (84.8% of total pesticide poisoning deaths). The majority of the pesticide poisoning deaths were men, over 50 years old, with education less than middle school, and residing in rural areas. The rate of pesticide poisoning deaths was the highest in the farming period and was significantly correlated with the rurality index of each region. CONCLUSIONS: Pesticide poisoning deaths substantially increased during the 10-year study period, and showed demographic, seasonal and regional variations. More intensive intervention efforts to reduce pesticide mortality should become a public health priority in South Korea.

Limjindaporn, C. (2010). "Acute poison exposure in the emergency department: a 2-year study in a university hospital." *J Med Assoc Thai* **93 Suppl 7**: S41-49. BACKGROUND: Pattern of acute poison exposure varies in the different areas. The information will be useful for prevention. OBJECTIVE: To evaluate pattern, severity and clinical outcome of acute poison exposure in the Emergency Department of a University Hospital in Thailand. MATERIAL AND METHOD: Medical records of all acute poison exposure cases, presented the Emergency Department of Thammasat University Hospital between October 1, 2006 and September 30, 2008 were reviewed retrospectively. Demographic characteristics, exposure time, agents, route and cause of exposure, clinical course and outcome were analyzed. RESULTS: Of the total 76,805 Emergency Department visits, 1112 cases were related to acute poison exposures, which were accounted for 1.4%. Sixty-five percents were female. Patients whom their ages ranging from 21 to 40 years old showed the highest rate of acute poison exposures. Intentional and unintentional exposures accounted for 52.7% and 44.9%, respectively. Intentional exposure was the major cause of exposure in the age group of 11-40 years, while unintentional exposure was the major cause of exposure in children. Pharmaceutical products (38.1%) were the most common category of substances involved in acute poison exposure followed by bites and stings (31.7%) and household products (17.6%). The substances most frequently involved were acetaminophen (17.7%) and toilet cleaning agents (12.3%). Fifty-six (5%) cases developed severe clinical course and three (0.27%) patients died. Pesticide and toilet cleaning agents were responsible for all these fatalities. CONCLUSION: Acetaminophen and toilet cleaning agents were commonly involved in acute poison exposure. Pesticide and toilet cleaning agents caused severe morbidity and mortality. Unintentional exposure was the major cause of exposure in children. Public education regarding the danger of these agents and prevention of the poison exposure in children should be emphasized.

Liu, Q., L. Zhou, et al. (2009). "Poisoning deaths in China: type and prevalence detected at the Tongji Forensic Medical Center in Hubei." *Forensic Sci Int* **193**(1-3): 88-94.

The records of 218 poisoning deaths from a Department of Forensic Medicine in a University of China, Tongji Center for Medicolegal Expertise in Hubei (TCMEH), from 1999 to 2008 were retrospectively reviewed. The majority (69.7%) of fatalities was between the ages of 20 and 49 years, and there was a male preponderance (male:female=1.7:1). The most common classes of substances involved in fatalities were rodenticide (19.7%), insecticide and herbicide (17.9%), carbon monoxide (16.5%), drugs (13.8%) and alcohols (12.4%). Ingestion was the predominant route of exposure (65.1%), followed in frequency by inhalation, injection and dermal. In vast majority (64.7%), the manner of death was accidental; suicidal intent was present in 25.2% of cases, homicide in 3.7%, and undetermined 6.4%. When compared to the former reports from the same institution, one for 1956-1984 and another for 1983-1999, an increase was found in the proportion of deaths due to rodenticides, CO, alcohols and drugs, as well as in accidental poisoning deaths. Poisoning deaths due to pesticides remain the major public health problem in China. Further regulatory enforcement should be carried out by government to restrict and manage the use of pesticides and rodenticides which are most toxic to humans.

Manuel, C., D. J. Gunnell, et al. (2008). "Self-poisoning in rural Sri Lanka: small-area variations in incidence." *BMC Public Health* **8**: 26.

**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.

Manuweera, G., M. Eddleston, et al. (2008). "Do targeted bans of insecticides to prevent deaths from self-poisoning result in reduced agricultural output?" Environ Health Perspect **116**(4): 492-495.

**BACKGROUND:** The pesticides monocrotophos, methamidophos, and endosulfan were a very common cause of severe poisoning in Sri Lanka during the 1980s and early 1990s, before they were banned in 1995 and 1998. Now, the most commonly used insecticides are the less toxic World Health Organization Class II organophosphorus pesticides and carbamates. These bans were followed by a large reduction in both fatal poisonings and suicide in Sri Lanka. **OBJECTIVE:** We aimed to see if these bans adversely affected agricultural production or costs. **METHODS:** We used data from the World Resources Institute to compare the yields of the main crop groups in Sri Lanka with those from surrounding South Asian countries for 1980-2005. We also examined data from the Sri Lankan Department of Census and Statistics to examine the yields of 13 specific vegetable crops and rice for 1990-2003, along with the costs of rice production. **RESULTS:** We found no drop in productivity in the years after the main bans were instituted (1995, 1998). We observed substantial annual fluctuation in estimated yields in all data sources, but these did not coincide with the bans and were no larger than the fluctuations in other countries. Also, there was no sudden change in costs of rice production coinciding with bans. **CONCLUSIONS:** Countries aiming to apply restrictions to reduce deaths from pesticide poisoning should evaluate agricultural needs and develop a plan that encourages substitution of less toxic pesticides. If farmers have an affordable alternative for pest control for each crop, there is no obvious adverse effect on agricultural output.

Marahatta, S. B., J. Singh, et al. (2009). "Poisoning cases attending emergency department in Dhulikhel Hospital- Kathmandu University Teaching Hospital." Kathmandu Univ Med J (KUMJ) **7**(26): 152-156.

**OBJECTIVE:** The objective of the present study is to evaluate the characteristics of acute poisoning cases admitted to emergency department over a one year period. The demographic, clinical and psycho-social aspects of the patients were analysed. **MATERIALS AND METHODS:** A hospital based study was carried out in the emergency department, Kathmandu University Teaching Hospital/ Dhulikhel Hospital, Dhulikhel analysing the data of the poisoning cases attended for one year. The study was carried out amongst inpatients attending emergency with acute poisoning. **RESULTS:** A total of 54 patients were admitted to the emergency department with acute poisoning. The female-to-male ratio was 1.34:1. Most poisoning occurred in the age group of above 40 years. The mean ages of female and male were 29.87 + or - 14.85 years and 35.54 + or - 15.02 years respectively. By occupation 40.38% of the cases were farmers. Only 35.29% of the patients were illiterate. 79.24% of the cases intentionally consume the poison. Organ phosphorus poisoning (OP) was the most common poisoning. Oral route was the commonest route of poisoning accounting 98.1%. Sixty-six percentage (66.66%) of the cases had the poison stored in their home with 27.7% bought from the market once needed. Among the cases of acute poisoning 5.55% were fatal. **CONCLUSION:** The following conclusions were reached: (1) females were at greater risk for poisoning than males, (2) self-poisoning

cases constituted the majority of all poisonings, and (3) the main agents of self-poisoning were OP poisoning.

Mohanty, M. K., V. Kumar, et al. (2004). "An analysis of poisoning deaths in Manipal, India." *Vet Hum Toxicol* **46**(4): 208-209.

To determine the various factors involved in poisoning deaths, a 10-y retrospective review of 335 cases were carried out. There was an increasing trend in number of poisoning deaths from 1993-94 to 1999-2000, followed by a decline trend the last 2 y (2001-02). Ninety-one percent of the deaths were due to self-poisoning, with 77.6% of the fatalities due to insecticide consumption. Most cases occurred during winter and in the victim's rural home. Amongst all the poisoning deaths, 249 were males and 86 were females, most in the of 20-29 y age group. Suggestions have been made for the prevention of insecticide poisoning.

Nguyen, T. V., C. Dalman, et al. (2010). "Suicide attempt in a rural area of Vietnam: Incidence, methods used and access to mental health care." *Int J Ment Health Syst* **4**(1): 3.

**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.

Padmanabha, T. S., K. M. Gumma, et al. (2013). "Pattern of poisoning cases admitted in a tertiary care hospital." *Indian Journal of Pharmacology Conference: 46th Annual Conference of the Indian Pharmacological Society, IPSCON 2013 Bangalore India. Conference Start: 20131216 Conference End: 20131218. Conference Publication: (var.pagings). 45: S274.*

**Objective:** Poisoning is one of the major causes of hospitalization and is a major public health problem in the country. India is a developing country in south Asia. Rural population of this country is mostly dependent on agriculture. Pesticides are the most commonly used substances and are

easily accessible. The knowledge of pattern of poisoning cases encountered in a particular area is useful to prepare health care professionals to handle these emergencies efficiently. Materials and Methods: A retrospective analysis of poisoning cases admitted to the emergency department of District Government Hospital, Bidar from July 2012 to December 2012 was done to study the pattern of poisoning, mode of poisoning, type of poison, age group involved & outcome were analyzed from hospital records. Results: Total 644 patient records were studied. Acute poisoning in the age group of 21-30 years was the most common with higher frequency in males. Most common intention was suicidal. Organophosphorus compounds were most common cause of poisoning followed by snake bite and drug intake. Overall mortality rate due to poisoning was 5.6% and it was highest among organophosphorus compound poisoning. Conclusion: Highest number of cases of poisoning was encountered in young males. Organophosphorus compounds were most commonly used substance with suicidal intention. The reasons being agriculture based economic, poverty and easy availability of highly toxic pesticides. Community education, early care in tertiary care hospitals and establishment of poison information centre (PIC) may help to reduce the mortality.

Paholpak, P., P. Rangseekajee, et al. (2012). "Characteristics and burden of hospitalization because of intentional self-harm: Thai national, hospital-based data for 2010." J Med Assoc Thai **95 Suppl 7**: S156-162.

BACKGROUND: There is a paucity of data on intentional self-harm and suicide in Thailand. It is crucial to re-evaluate the burden and health outcomes. OBJECTIVE: To measure the character and burden of acts of intentional self-harm in the Thai hospitalized population. MATERIAL AND METHOD: Acts of intentional-self harm were categorized using ICD 10 classification. All of inpatient-related data were analyzed using SPSS 17. RESULTS: Overall intentional self-harm in 2010 led to 24,924 hospitalizations and 854 deaths; an incidence of 35.6/100,000 people with the highest level in two age groups: 18-25 and 26-40 year-olds. Self-poisoning (89%) was the most common method and pesticide was the leading used chemical agents. The total cost of treatment was 149,672,190 baht and the mean length of stay was 2.9 +/- 6.7 days. The mortality rate increased as the population got older with the highest rate being 10.6% for 70-79 year-olds. In 33.8% of cases, psychiatric co-diagnosis were found with anxiety disorders was the leading comorbidity. CONCLUSION: The incidence of intentional self-harm was medium to high, compared to other East Asians countries. Self-poisoning by exposure to pesticides was the most common self-harm method. Age over 60 had the highest mortality rate. Having a psychiatric co-diagnosis was common.

Parikh, F. (2009). "Changing trends in poisoning." J Assoc Physicians India **57**: 739.

Patil, S. and C. Shivakumar (2011). "A study of deliberate self-harm patients attending tertiary care teaching hospitals in South India." Australasian Medical Journal **4 (6)**: 277-279.

Paudyal, B. P. (2005). "Poisoning : pattern and profile of admitted cases in a hospital in central Nepal." *JNMA J Nepal Med Assoc* **44**(159): 92-96.

An analysis of all poisoning cases admitted in medical and pediatric wards of Patan Hospital for one year (1st Jan to 31st Dec 2004) was carried out. A total of 154 cases were admitted which was 0.8% of total hospital admissions. Females outnumbered males and almost two-thirds patients were young adults (15-34 years). Seasonal variation in poisoning was observed with more cases in the summer months. Organophosphorus compounds (42%), drugs (25%), and zinc phosphide (6.5%) were common poisonings in total and in adult populations, whereas kerosene was the most frequent poisoning in pediatric age group. Paracetamol, benzodiazepines, and tricyclic antidepressants were the most frequently used drugs. The circumstances of poisoning were intentional (75%) and accidental (20%); most of the childhood poisonings were accidental in nature. The mean hospital stay for all type of poisoning was 7.5 days; whereas it was 10.2 days for organophosphorus, 2.5 days for paracetamol, and 1.5 days each for zinc phosphide and kerosene ingestion. Intensive care unit (ICU) service was required in 17% of patients; and almost 25% developed complications. Aspiration pneumonia and respiratory failure were the most frequently observed complications. Ninety four percent of admitted patients recovered completely; leaving a mortality rate of 5%.

Pearson, M., Z. B. Anthony, et al. (2010). "Prospective policy analysis: how an epistemic community informed policymaking on intentional self poisoning in Sri Lanka." *Health Res Policy Syst* **8**: 19.

**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.

Pearson, M., F. Konradsen, et al. (2011). "A community-based cluster randomised trial of safe storage to reduce pesticide self-poisoning in rural Sri Lanka: study protocol." BMC Public Health **11**: 879.

**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.

Pearson, M., A. B. Zwi, et al. (2013). "Policymaking 'under the radar': a case study of pesticide regulation to prevent intentional poisoning in Sri Lanka." Health Policy Plan.

**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.

Pearson, M., A. B. Zwi, et al. (2014). "Taking stock -- what is known about suicide in Sri Lanka: a systematic review of diverse literature." *Crisis* **35**(2): 90-101.

BACKGROUND: Suicide is and has been a major public health problem in Sri Lanka and has generated a wide range of literature. AIMS: This review aimed to systematically appraise what is known about suicide in Sri Lanka. The patterns and content of articles were examined and recommendations for further research proposed. METHOD: The paper describes the systematic search, retrieval, and quality assessment of studies. Thematic analysis techniques were applied to the full text of the articles to explore the range and extent of issues covered. RESULTS: Local authors generated a large body of evidence of the problem in early studies. The importance of the method of suicide, suicidal intention, and the high incidence of suicide were identified as key foci for publications. Neglected areas have been policy and health service research, gender analysis, and contextual issues.

CONCLUSION: The literature reviewed has produced a broad understanding of the clinical factors, size of the problem, and social aspects. However, there remains limited evidence of prevention, risk factors, health services, and policy. A wide range of solutions have been proposed, but only regulation of pesticides and improved medical management proved to be effective to date.

Peshin, S. S., A. Srivastava, et al. (2014). "Pesticide poisoning trend analysis of 13 years: a retrospective study based on telephone calls at the National Poisons Information Centre, All India Institute of Medical Sciences, New Delhi." *J Forensic Leg Med* **22**: 57-61.

The study was designed to analyze the incidence and pattern of pesticide poisoning calls reported to the National Poisons Information Centre (NPIC), AIIMS, New Delhi and highlight the common classes of pesticides involved in poisoning. The telephone calls received by the Centre during the thirteen year period (1999-2012) were entered into a preset proforma and then into a retrievable database. A total of 4929 calls of pesticide poisoning were

recorded. The data was analyzed with respect to age, gender, mode and type of poisoning. The age ranged from 1 to 65 years with the preponderance of males (M = 62.19%, F = 37.80%). The age group mainly involved in poisoning was 18-35 years. While 59.38% calls pertained to household pesticides, 40.61% calls related to agricultural pesticides. The common mode of poisoning was intentional (64.60%) followed by accidental (34.40%) and unknown (1%). Amongst the household pesticides, the highest number of calls were due to pyrethroids (26.23%) followed by rodenticides (17.06%), organophosphates (6.26%), carbamates (4.95%) and others (4.86%). In agricultural pesticides group, the organophosphates (9.79%) ranked the first followed by, aluminium phosphide (9.65%), organochlorines (9.31%), pyrethroids (3.87%), herbicides, weedicides and fungicides (3.20%), ethylene dibromide (2.82%), and others (1.70%). The data analysis shows a high incidence of poisoning due to household pesticides as compared to agricultural pesticides, clearly emphasizing the need for creating awareness and education about proper use and implementation of prevention programmes.

Pradhan, S. N. and S. R. Adhikary (2009). "A study of severity of intention of suicide in various psychiatric diagnoses." Kathmandu University Medical Journal **7 (25)**: 63-66.

Background: Suicidal intent has been described as the seriousness or intensity of the patient's wish to terminate his or her life. Suicide has become an important public health issue throughout the world. It is important to evaluate the intentions of suicide attempts and various psychiatric diagnostic perspectives to understand the multiple dimensions of suicide. Aims: The aim of the work was to study the severity of suicidal intention among suicide attempters in different psychiatric diagnoses and different mode of attempted suicide. Materials and methods: This study was carried out in the patients, who attempted suicide, by various modes, who were admitted in the wards of KMCTH during 1st January 2007 to 30th December 2007. Suicide Intent Scale (SIS) was used in all the cases that had attempted suicide. Results: Total numbers of patients was 43. Mean SIS was 13.88. The results have shown that majority of cases were female 69.8% (n=30) and male were 30.2% (n=13). The commonest mode of suicide was poisoning 83.7% (n=36) in which moderate suicide intent was 58.3% (n=21); mild suicide intent 33.3% (n=12) and severe suicide intent 8.3% (n=3). Pesticide (organophosphorus) ingestion was the commonest mode of suicide 44.4% (n=16), followed by pharmacological drugs 33.3% (n=12). The commonest psychiatric diagnosis was depressive disorders 62.9% (n=27), in which moderate suicide intent was found to be maximum 70.4% (n=19) followed by mild suicide intent 14.8% (n=4) and severe suicide intent 14.8% (n=4). Conclusion: The increasing problem of pesticide poisoning and drug overdose demands strict legal scrutiny in the availability of common means of attempting suicide.

Radhakrishnan, R. and C. Andrade (2012). "Suicide: An Indian perspective." Indian Journal of Psychiatry **54 (4)**: 304-319.

Suicide is the third leading cause of death among young adults worldwide. There is a growing recognition that prevention strategies need to be tailored to the region-specific demographics of a country and to be implemented in a

culturally-sensitive manner. This review explores the historical, epidemiological and demographic factors of suicide in India and examines the strategies aimed at the prevention of suicide. There has been an increase in the rates of suicide in India over the years, although trends of both increases and decline in suicide rates have been present. Distinct from global demographic risk factors, In India, marital status is not necessarily protective and the female: male ratio in the rate of suicide is higher. The motives and modes of suicide are also distinct from western countries. Preventive strategies implemented at a community level and identifying vulnerable individuals maybe more effective than global strategies.

Rajapakse, T., K. M. Griffiths, et al. (2013). "Characteristics of non-fatal self-poisoning in Sri Lanka: a systematic review." *BMC Public Health* **13**: 331.

**BACKGROUND:** The rate of non-fatal self-poisoning in Sri Lanka has increased in recent years, with associated morbidity and economic cost to the country. This review examines the published literature for the characteristics and factors associated with non-fatal self-poisoning in Sri Lanka. **METHODS:** Electronic searches were conducted in Psychinfo, Proquest, Medline and Cochrane databases from inception to October 2011. **RESULTS:** 26 publications (representing 23 studies) were eligible to be included in the review. A majority of studies reported non-fatal self-poisoning to be more common among males, with a peak age range of 10-30 years. Pesticide ingestion was the most commonly used method of non-fatal self-poisoning. However three studies conducted within the last ten years, in urban areas of the country, reported non-fatal self-poisoning by medicinal overdose to be more common, and also reported non-fatal self-poisoning to be more common among females. Interpersonal conflict was the most commonly reported short-term stressor associated with self-poisoning. Alcohol misuse was reported among males who self-poisoned, and data regarding other psychiatric morbidity was limited. **CONCLUSIONS:** The findings indicate that pesticide ingestion is the commonest method of non-fatal self-poisoning in Sri Lanka, and it is more common among young males, similar to other Asian countries. However there appears to be an emerging pattern of increasing medicinal overdoses, paralleled by a gender shift towards increased female non-fatal self-poisoning in urban areas. Many non-fatal self-poisoning attempts appear to occur in the context of acute interpersonal stress, with short premeditation, and associated with alcohol misuse in males. Similar to other Asian countries, strategies to reduce non-fatal self-poisoning in Sri Lanka require integrated intervention programs with several key aspects, including culturally appropriate interventions to develop interpersonal skills in young people, community based programs to reduce alcohol misuse, and screening for and specific management of those at high risk of repetition following an attempt of self-poisoning.

Rajasuriar, R., R. Awang, et al. (2007). "Profile of poisoning admissions in Malaysia." *Hum Exp Toxicol* **26**(2): 73-81.

We retrospectively reviewed poisoning admissions to all government health facilities from 1999 to 2001, in an effort to expand our current knowledge on poisoning in Malaysia to a level that better reflects a nationwide burden. There were 21 714 admissions reported with 779 deaths. The case-fatality

rate was 35.88/1000 admissions. The majority of admissions (89.7%) and deaths (98.9%) occurred in adults. Some 55.1% of all admissions were female, mostly involving pharmaceutical agents. Male poisoning admissions were more often due to chemical substances. The prevalence of poisoning and death was highest among Indians compared to all other races in Malaysia. Overall, the majority of poisoning admissions were due to pharmaceutical agents, with agents classified as non-opioid analgesics, anti-pyretics and anti-rheumatics the most common. Pesticides accounted for the largest number of fatalities. It was also the commonest substance reported in cases of intentional self-harm. Most cases of poisoning admissions occurred due to accidental exposure (47%), followed by cases of intentional self-harm (20.7%). Overall, this study has managed to contribute substantial additional information regarding the epidemiology of poisoning in Malaysia, highlighting important issues, such as the rampant poisonings involving pesticides and analgesics, as well as the high prevalence of poisoning among Indians in Malaysia.

Rao Ch, S., V. Venkateswarlu, et al. (2005). "Pesticide poisoning in south India: Opportunities for prevention and improved medical management." Tropical Medicine and International Health **10** (6): 581-588.

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. 2005 Blackwell Publishing Ltd.

Roberts, D. M., A. Karunaratna, et al. (2003). "Influence of pesticide regulation on acute poisoning deaths in Sri Lanka." Bull World Health Organ **81**(11): 789-798.

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.

Senarathna, L., S. F. Jayamanna, et al. (2012). "Changing epidemiologic patterns of deliberate self poisoning in a rural district of Sri Lanka." *BMC Public Health* **12**: 593.

BACKGROUND: Acute poisoning is a major public health issue in many parts of the world. The epidemiology and the mortality rate is higher in low and middle income countries, including Sri Lanka. The aim of this study was to provide details about the epidemiology of acute poisoning in a rural Sri Lankan district and to identify the changing patterns and epidemiology of poisoning. METHODS: A prospective study was conducted from September 2008 to January 2010 in all hospitals with inpatient facilities in Anuradhapura district of North Central Province of Sri Lanka. Acute poisoning data was extracted from patient charts. Selected data were compared to the data collected from a 2005 study in 28 hospitals. RESULTS: There were 3813 poisoned patients admitted to the hospitals in the Anuradhapura district over 17 months. The annual population incidence was 447 poisoning cases per 100,000 population. The total number of male and female patients was approximately similar, but the age distribution differed by gender. There was a very high incidence of poisoning in females aged 15-19, with an estimated cumulative incidence of 6% over these five years. Although, pesticides are

still the most common type of poison, medicinal drug poisonings are now 21% of the total and have increased 1.6 fold since 2005. CONCLUSIONS: Acute poisoning remains a major public health problem in rural Sri Lanka and pesticide poisoning remains the most important poison. However, cases of medicinal drug poisoning have recently dramatically increased. Youth in these rural communities remain very vulnerable to acute poisoning and the problem is so common that school-based primary prevention programs may be worthwhile. Lalith Senarathna, Shaluka F Jayamanna, Patrick J Kelly, Nick A Buckley, Michael J Dibley, Andrew H Dawson. These authors contributed equally to this work.

Senewiratne, B. and S. Thambipillai (1974). "Pattern of poisoning in a developing agricultural country." British Journal of Preventive and Social Medicine **28 (1)**: 32-36.

A total of 472 cases of poisoning were seen over a two year period in Kandy, Ceylon. The overall mortality was 23.7%. The pattern of poisoning was different from that in western countries in that 49.8% of the cases were due to insecticide poisoning and only 10.7% were due to drugs, including barbiturates. Insecticides accounted for 73.2% and drugs for only 4.5% of the 112 fatal cases. Of the fatal cases 51.7% were between the ages of 20 and 40 years and only 6.2% were over 50 years. The wastage of economically useful lives indicates the need for a poison centre.

Seok, S. J., H. W. Gil, et al. (2009). "Paraquat intoxication in subjects who attempt suicide: why they chose paraquat." Korean J Intern Med **24(3)**: 247-251.

BACKGROUND/AIMS: Paraquat (PQ) has been used in suicide attempts; an estimated 2,000 toxic ingestions occur annually, with 60-70% mortality. We sought to determine why PQ is such a common agent for suicide attempts in Korea. METHODS: We analyzed 250 cases (143 males, 107 females) of attempted suicide by PQ ingestion from January to December 2007. The procurement of the PQ was divided into two categories: purchased and preexisting. RESULTS: Men were more likely to have purchased PQ than women (66% vs. 22%,  $p=0.042$ ). Additionally, men were more likely to be unmarried ( $n=34$ , 23.9% vs.  $n=10$ , 9.3%) or divorced or separated ( $n=16$ , 11.3% vs.  $n=5$ , 4.6%) than the women ( $p<0.001$ ). The group who intentionally selected PQ (38.4%) consisted of 96 cases (54 males, 42 females) and the group who did not intentionally select PQ (61.6%) included 154 cases (89 males, 65 females). The incidence of PQ purchase was higher in the intentional selection PQ group (46.9% vs. 18.2%,  $p<0.01$ ).

CONCLUSIONS: Only 38% of patients who attempted suicide with PQ intentionally selected PQ. Thus, greater control of PQ availability is needed, especially in patients at risk.

Shin, S. D., G. J. Suh, et al. (2004). "Epidemiologic characteristics of death by poisoning in 1991-2001 in Korea." J Korean Med Sci **19(2)**: 186-194.

The purpose of this study was to investigate the epidemiologic characteristics of the death by poisoning in Korea. We recoded the Death Certificates Database by injury based on the short version of the International Classification of External Causes of Injuries (ICECI). We evaluated the mortality rate by total injury and poisoning, and analyzed the mortality rate by age, gender, year and month, toxic agent, and intent. Adjusted odds ratios

were calculated to evaluate the effects of socioeconomic factors on suicidal poisoning death. The total number of death cases by injury was 346,656. The proportion of death cases by injury decreased from 13.53% of all death cases in 1991 to 11.89% in 2001. However, the mortality rate by poisoning increased rapidly from 1998, and then remained stable. The number of suicidal poisoning deaths has gradually increased, and its mortality rate was 6.41 (per 100,000) in 2001. Major toxic agents were pesticides and herbicides (50.90%) in 2001. Adjusted odds ratios of suicidal poisoning versus other poisonings showed significant differences in education attainment, region, and marital status. In conclusion, the mortality rate by poisoning has increased, and the proportion of suicidal poisoning also has increased compared to that of accidental poisoning.

Singh, B. and B. Unnikrishnan (2006). "A profile of acute poisoning at Mangalore (South India)." J Clin Forensic Med **13**(3): 112-116.

**BACKGROUND:** The aim of this study was to characterize the poisoning cases admitted to the Government Wenlock Hospital (a teaching hospital of Kasturba Medical College) Mangalore, India. **STUDY DESIGN:** All cases admitted to the emergency department of the hospital between January 2001 to May 2003 evaluated retrospectively. Data obtained from the hospital medical records and included the following factors: socio-demographic characteristics, agents and route of intake, and time of admission of the acutely poisoned patients. **RESULTS:** Of the total 33,207 patients admitted in the hospital for treatment, 325 patients were for acute poisoning. This was 1% of all emergency admissions. Of these 70% were males and 30% females. The majority (36%) cases were from age group of 21-30 years. Most (72%) poisonings were intentional and only 27% were unintentional. The most important agents of acute poisoning were agrochemical pesticides (49%) followed by drugs (17%), and alcohols (13%). Forty-eight (15%) patients died. The poisons responsible for most of the mortality were organophosphate pesticides (65%) and aluminium phosphide (15%). In summary, the prevention and treatment of poisoning due to organophosphate and aluminium phosphide should merit high priority in the health care of the indigenous population of South India (Dakshina Kannada district).

Srinivas Rao, C., V. Venkateswarlu, et al. (2005). "Pesticide poisoning in south India: opportunities for prevention and improved medical management." Trop Med Int Health **10**(6): 581-588.

**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.

Srivastava, A., S. S. Peshin, et al. (2005). "An epidemiological study of poisoning cases reported to the National Poisons Information Centre, All India Institute of Medical Sciences, New Delhi." *Hum Exp Toxicol* **24**(6): 279-285.

A retrospective analysis of poisoning calls received by the National Poisons Information Centre showed a total of 2719 calls over a period of three years (April 1999-March 2002). The queries were made on poisoning management (92%) and information (8%) about various products and functioning of the centre. The data were analysed with respect to age, sex, mode and type of poisoning. The agents belonged to various groups: household products, agricultural pesticides, industrial chemicals, drugs, plants, animal bites and stings, miscellaneous and unknown groups respectively. The age ranged from less than 1 to 70 years, with the highest incidence in the range of 14-40 years, with males (57%) outnumbering females (43%). The most common mode of poisoning was suicidal (53%), followed by accidental (47%). The route of exposure was mainly oral (88%). Dermal (5%), inhalation and ocular exposure contributed 7% to the total. The highest incidence of poisoning was due to household agents (44.1%) followed by drugs (18.8%), agricultural pesticides (12.8%), industrial chemicals (8.9%), animals bites and stings (4.7%), plants (1.7%), unknown (2.9%) and miscellaneous groups (5.6%). Household products mainly comprised of pyrethroids, rodenticides, carbamates, phenyl, detergents, corrosives etc. Drugs implicated included benzodiazepines, anticonvulsants, analgesics, antihistamines, tricyclic antidepressants, thyroid hormones and oral contraceptives. Among the agricultural pesticides, aluminium phosphide was the most commonly consumed followed by organochlorines, organophosphates, ethylene dibromide, herbicides and fungicides. Copper sulphate and nitrobenzene were common among industrial chemicals. The bites and stings group comprised of snake bites, scorpion, wasp and bee stings. Poisoning due to plants was low, but datura was the most commonly ingested. An alarming feature of the study was the high incidence of poisoning in children (36.5%). The age ranged from less than 1 to 18 years and the most vulnerable age group included children from less than 1 year to 6 years. Accidental mode was the most common (79.7%). Intentional attempts were also noticed (20.2%) in the age group above 12 years. The present data may not give an exact picture of the incidence of poisoning in India, but represents a trend in our country. The Poisons Information Centre plays a vital role in providing timely management guidelines including the supply of necessary antidotes from the recently established National Antidote Bank, thereby helping to save precious lives.

Subba, S. H., V. S. Binu, et al. (2009). "Pattern and trend of deliberate self-harm in western Nepal." J Forensic Sci **54**(3): 704-707.

Acts of deliberate self-harm (DSH) not only affect the people directly involved, but also have grave psychological and social impact on the family and community. In the present study, a cohort of 173 cases of DSH reported from April 2002 to March 2005 was retrospectively analyzed, by perusing the medicolegal register maintained by the Emergency Department at the Western Regional Hospital, Pokhara in the Western Development Region of Nepal. The data were entered and analyzed using SPSS Version 10.1. More than two-thirds of total cases were females. About 60% of cases were observed in the age group of 15-24 years. Poisoning (89.6%) was the most preferred method of deliberate self-harm. Organophosphate pesticides were consumed in nearly two-thirds of the poisoning cases. The majority of cases were reported during the months of May to July and had occurred during the last quarter of the day. More than a twofold increase was observed in the frequency of cases during the 3-year study period. The said observations were compared and contrasted with the available literature across the globe. The presentation is concluded by highlighting the limitations encountered in Nepal and the scope to overcome the same.

Sun, J., X. Guo, et al. (2011). "Seasonality of suicide in Shandong China, 1991-2009: associations with gender, age, area and methods of suicide." J Affect Disord **135**(1-3): 258-266.

BACKGROUND: Whether suicide in China has significant seasonal variations is unclear. The aim of this study is to examine the seasonality of suicide in Shandong China and to assess the associations of suicide seasonality with gender, residence, age and methods of suicide. METHODS: Three types of tests (Chi-square, Edwards' T and Roger's Log method) were used to detect the seasonality of the suicide data extracted from the official mortality data of Shandong Disease Surveillance Point (DSP) system. Peak low ratios (PLRs) and 95% confidence intervals (CIs) were calculated to indicate the magnitude of seasonality. RESULTS: A statistically significant seasonality with a single peak in suicide rates in spring and early summer, and a dip in winter was observed, which remained relatively consistent over years. Regardless of gender, suicide seasonality was more pronounced in rural areas, younger age groups and for non-violent methods, in particular, self-poisoning by pesticide. CONCLUSIONS: There are statistically significant seasonal variations of completed suicide for both men and women in Shandong, China. Differences exist between residence (urban/rural), age groups and suicide methods. Results appear to support a sociological explanation of suicide seasonality.

Sundarka, M. K., H. L. Gupta, et al. (2000). "Self injection of insecticide." J Assoc Physicians India **48**(8): 856.

Thanh, H. T. T., G. X. Jiang, et al. (2005). "Attempted suicide in Hanoi, Vietnam." Social Psychiatry and Psychiatric Epidemiology **40**(1): 64-71.

Background Attempted suicide is a key predictor of suicide, which is among the dominant causes of young people's deaths worldwide. Very little is known about the characteristics of suicide attempters in Asia, especially in Vietnam.

Methods Medical records of 509 patients (515 attempted-suicide events) admitted to Bach Mai General Hospital in Hanoi, Vietnam from 1 January 1999 to 30 April 2001 were analysed according to the criteria of the WHO Multicentre Study of Attempted Suicide. Results The suicide attempters' mean age was 28.3+/-2.9 years. Nearly half (48.7%) were aged 15-24. The female-to-male ratio of patients living in urban areas (2.1:1) was higher than in rural areas (1.2:1). In urban areas, students (32 %) and homeworkers (28%) and, in rural areas, farmers (56 %) and students (17%) were the salient occupational categories. Acute life stressors were the main causes (73.8%) of suicide attempts. Only in some 6% of cases had a psychiatric illness been diagnosed before the suicide attempts. As a means of attempting suicide, intoxication with analgesics and antipyretics (e. g. paracetamol) with low medical lethality scores was a frequent method among the urban patients, the majority of whom (81%) consequently stayed in hospital less than 24 h. Pesticide and rat poison, more commonly (57.2%) used by attempters in rural areas, had higher medical lethality scores and also necessitated more prolonged hospital treatment. Conclusions Some suicide-preventive strategies used in the West for young people may be applicable in Vietnam. Reducing access to pesticides and rat poison is comparable to western efforts to make paracetamol or firearms less freely available. Skills in resolving family and other conflicts can be taught in schools according to WHO's suicide-prevention resources for teachers.

Thomas, M., S. Anandan, et al. (2000). "Profile of hospital admissions following acute poisoning--experiences from a major teaching hospital in south India." Adverse Drug React Toxicol Rev **19**(4): 313-317.

This study was conducted to determine the incidence of hospital admissions following acute poisoning, nature of agents involved and change in pattern of poisoning over a 5-year period. Data from hospital records of all admissions to emergency department following acute poisoning collected prospectively were analysed for the period January 1993 to January 1998. A steady increase in deliberate poisoning using pesticides, particularly among young adults, was noted. Kerosene (paraffin) was the commonest poison in children and plant poisons were also common. There were 52 deaths (3.3%) among the 1584 admissions. The majority of deaths were due to pesticides. Poisoning and mortality followed ingestion of readily-available and commonly used agents. Measures to increase public education, counselling and awareness could prevent a number of these admissions.

van der Hoek, W. and F. Konradsen (2005). "Risk factors for acute pesticide poisoning in Sri Lanka." Trop Med Int Health **10**(6): 589-596.

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.

van der Hoek, W. and F. Konradsen (2006). "Analysis of 8000 hospital admissions for acute poisoning in a rural area of Sri Lanka." *Clin Toxicol (Phila)* **44**(3): 225-231. 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. METHODS: Time series of incidence of acute poisoning based on retrospective in-patient records of six government hospitals in southern Sri Lanka from 1990 to 2002. 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.

Van der Hoek, W., F. Konradsen, et al. (1998). "Pesticide poisoning: a major health problem in Sri Lanka." *Soc Sci Med* **46**(4-5): 495-504.

Acute pesticide poisoning is a major public health problem in Sri Lanka. In several agricultural districts, it precedes all other causes of death in government hospitals. Most of the acute poisoning cases are intentional (suicide) and occur among young adults, mainly males. Poisoning due to occupational exposure is also common, but less well documented. In an irrigation area in Sri Lanka a very high incidence of serious pesticide poisoning was observed, with 68% due to intentional ingestion of liquid pesticides. It is argued that the easy availability and widespread use of highly

hazardous pesticides is the most important reason for this high number of poisoning cases. The frequent application of highly hazardous pesticides in high concentrations was often irrational and posed serious health and financial risks to the farmers. Sales promotion activities and credit facilities promoted this excessive pesticide use, which was not counteracted by an agricultural extension service. Hazardous practices when spraying pesticides were due to the impossibility of applying recommended protective measures under the local conditions, rather than to lack of knowledge. Current emphasis on programs that promote the safe use of pesticides through education and training of farmers will be ineffective in Sri Lanka because knowledge is already high and most poisoning cases are intentional. Instead, enforcement of legislation to restrict availability of the most hazardous pesticides would result in an immediate health benefit. Improved agricultural extension services to promote alternative non-chemical methods of pest control is the most important strategy, in the long term, to prevent acute pesticide poisoning.

Veeresh, M. R. and P. S. Chidananda (2013). "Organo-chlorine pesticide fatalities - A retrospective study." Indian Journal of Forensic Medicine and Toxicology **7 (1)**: 217-220.

IA three year retrospective study was carried out with an aim to show the deleterious effect of Organochloro (OC) pesticides which is compounded by the inadequate history provided by victim's relatives. 11.90% of the deaths due to poisoning were attributed to OC's. 2/3rd of the victims were Males, 43.75% of them died within 6 hrs after consumption, and 33.75% were in their 3rd decade of life, 98.75% were acts of intentional poisoning and 40% of the deaths occurred in the months of December, January and February.

Vijayakumar, L., L. Jeyaseelan, et al. (2013). "A central storage facility to reduce pesticide suicides--a feasibility study from India." BMC Public Health **13**: 850.

**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.

Wananukul, W., C. Sriapha, et al. (2007). "Human poisoning in Thailand: The Ramathibodi Poison Center's experience (2001-2004)." *Clin Toxicol (Phila)* **45**(5): 582-588.

OBJECTIVE: To identify poisoning and toxic exposure pattern, severity, and clinical outcome in Thailand during 2001 to 2004. METHOD: This is a prospective study. All inquiries were registered, followed up, and verified. Interlocutors, poisons, patients' profiles, severity, and medical outcome after exposure or poisoning were analyzed. RESULTS: A total 14,428 events was suspected as human poisoning or exposure. After follow-up and verification, 98.9% were confirmed as poisoning or poison exposure. These involved 15,016 patients and accounted for 6.0 per 100,000 populations per year. The vast majority of calls (92.4%) were from physicians. Pesticides, household products, and pharmaceutical products were the most common poisons involved in human exposure, which were 41.5%, 19.5%, and 18.9%, respectively. Patients aged 0-6 years, teenagers and adults with 20-29 years of age had the highest rates of exposure, which were 33.0, 24.5, and 10.5 exposures per 100,000 per year, respectively. Unintentional accidental exposure is the major reason of exposure in children, but intentional suicide was the main reason of exposure in teenagers and adults. The death rate of all exposure was 5.5%. Pesticides cause more severe clinical course and the highest death rate (10.0%). CONCLUSION: Features of poisoning in Thailand were different from those in Western countries. Pesticide poisoning was the major problem in Thailand. Intentional suicide was the major circumstance of poison exposure in adults, but accidental exposure was the major reason of exposure in children.

Weerasinghe, M., M. Pearson, et al. (2014). "The role of private pesticide vendors in preventing access to pesticides for self-poisoning in rural Sri Lanka." *Inj Prev* **20**(2): 134-137.

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-poison 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.

Weerasinghe, M., R. Pieris, et al. (2008). "Safe storage of pesticides in Sri Lanka - identifying important design features influencing community acceptance and use of safe storage devices." *BMC Public Health* 8: 276.

**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.

Wickramasinghe, K., P. Steele, et al. (2009). "Cost to government health-care services of treating acute self-poisonings in a rural district in Sri Lanka." Bull World Health Organ **87**(3): 180-185.

**OBJECTIVE:** To estimate the direct financial costs to the Sri Lanka Ministry of Health of treating patients after self-poisoning, particularly from pesticides, in a single district. **METHODS:** Data on staff, drug, laboratory and other inputs for each patient admitted for self-poisoning were prospectively collected over a one-month period from one general hospital (2005) and five peripheral hospitals (2006) in the Anuradhapura district. Data on transfers to secondary- and tertiary-level facilities were obtained for a 6-month period from 30 peripheral hospitals. The cost of the inputs in United States dollars (US\$), using 2005 figures, was derived from hospital accounts. **FINDINGS:** The average total cost of treating a self-poisoned patient at the general hospital was US\$ 31.83, with ward staff input and drugs being the highest expenditure category and only US\$ 0.19 of this sum related to capital and maintenance costs. The average total cost of treatment was highest for self-poisoning with pesticides (US\$ 49.12). The patients placed in the intensive care unit, who comprised 5% of the total, took up 75% of the overall treatment cost for all self-poisoned patients at the general hospital. The average total cost of treating self-poisoned patients at peripheral hospitals was US\$ 3.33. The average patient cost per transfer was US\$ 14.03. In 2006, the total cost of treating self-poisoned patients in the Anuradhapura district amounted to US\$ 76,599, of which US\$ 53,834 were comprised of pesticide self-poisonings. Based on the total treatment cost per self-poisoned patient estimated in this study, the cost of treating self-poisoned patients in all of Sri Lanka in 2004 was estimated at US\$ 866,304. **CONCLUSION:** The cost of treating pesticide self-poisonings may be reduced by promoting the use of less toxic pesticides and possibly by improving case management in primary care hospitals. Additional research is needed to assess if increasing infrastructure and staff at peripheral hospitals could reduce the overall cost to the government, optimize case management and reduce pressure on secondary services.

Wu, K. C., Y. Y. Chen, et al. (2012). "Suicide methods in Asia: implications in suicide prevention." Int J Environ Res Public Health **9**(4): 1135-1158.

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.

Zhang, D., J. Zhang, et al. (2013). "A retrospective analysis of data from toxic substance-related cases in Northeast China (Heilongjiang) between 2000 and 2010." *Forensic Sci Int* **231**(1-3): 172-177.

The aim of this study was to analyze data from toxic substance-related cases in Northeast China (Heilongjiang Province) reported between 2000 and 2010, and to investigate the associations among the classes of toxic substances detected with gender, age, season, district of occurrence, and type of case. Pesticides, drugs, and alcohol were detected using gas chromatography-mass spectrometry or flame ionization detection. Carbon monoxide levels were measured using ultraviolet spectrometry, and levels of cyanides, nitrites, and acid were monitored using the chemical colorimetry method. Among a total of 565 cases, 208 (36.8%) were related to accidental injury/death, 175 (31.0%) to suicide, 80 (14.2%) to homicide, 43 (7.6%) to robbery, 29 (5.1%) to fire or arson, 20 (3.5%) to intentional injury/death, 7 (1.2%) to rape, and 3 (0.5%) to kidnapping. Men constituted 65.3% of the total 565 victims, most of who were between the ages of 31 and 50 years, with the average age being 44 years. The highest number of cases (126) was reported from Harbin, the capital of Heilongjiang Province. Pesticide-related cases accounted for 37.9% of the cases, with more cases occurring between April and August. Methomyl (48 cases) and fluoroacetamide (38 cases) were the most common pesticides involved in these cases. Drug-related cases accounted for 19.5% of the total poisoning cases, with benzodiazepines being the most commonly detected drugs (45 cases). More than 70% of alcohol-related cases involved the use of alcohol in crime (or affair) execution, with the blood alcohol concentration being less than 350 mg/100mL in these cases. Carbon monoxide was detected in 16.1% of the cases, with a higher yearly incidence noted in winter. To our knowledge, this is the first study to provide an overall analysis of toxic

substance-related cases in Northeast China. Similar to the findings observed in Central China (Hubei), our findings indicated that pesticides were the major cause of poisoning in the Heilongjiang Province of Northeast China.

Zhang, J. and H. Xu (2007). "Degree of suicide intent and the lethality of means employed: a study of Chinese attempters." *Arch Suicide Res* **11**(4): 343-350.

This study was designed to determine if there is a relationship between the degree of suicide intent and the lethality of means employed by those who try to kill themselves. The study sample consists of 74 suicide attempters admitted to emergency rooms in a northeastern area of China. Structured interviews were performed with the patients and their companions to the hospital if necessary. It was found that the reason for the suicide attempt claimed by the highest percentage of attempters (35 of 74) was love marriage issues, and there were significant gender differences in suicide reasons. It also was found that the choice of suicide means is generally independent of gender, and the lethality of means is positively correlated with the degree of suicide intent. One of the implications of the findings is a better understanding of the higher suicide rates for Chinese women than Chinese men. A hypothesis for future study on Chinese suicide may be that the high fatality rate of Chinese women who have swallowed poisonous pesticide is a function of the strong intent of death of the victim coupled with the well-known lethality of the pesticides.