Deliberate self-harm and suicide by pesticide ingestion in the Sundarban region, India

Sohini Banerjee, [1, 2, 3] Arabinda Narayan Chowdhury, [1] Esther Schelling, [2] Arabinda Brahma[1], Mrinal Kanti Biswas, [1] and Mitchell G Weiss [2]

[1]Institute of Psychiatry, 7, D.L. Khan Road, Kolkata 700 025, India

[2]Swiss Tropical Institute, Socinstrasse 57, Basel 4002, Switzerland

[3]Corresponding Author: s_o_h_i_n_i.@rediffmail.com

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Contributors

A.N. Chowdhury and S Banerjee conceptualised and designed the study. Statistical analyses were carried out by E. Schelling, M. G. Weiss and S. Banerjee. A. Brahma, M. K. Biswas and S. Banerjee were involved in collecting the data. S. Banerjee drafted the manuscript and A.N. Chowdhury, M. G. Weiss, E. Schelling M. K. Biswas and A. Brahma contributed to revisions in the final version.

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Summary

Deliberate self-harm (DSH) with pesticides is a serious health problem in many low-and middle-income agricultural countries, including the Sundarban region of West Bengal, India. This study examined the clinical epidemiology, including case fatality (CF) and determinants of self-harm in 6 island blocks of the region. Clinical records of DSH from 1999-2001 were examined for 1,277 DSH patients admitted to the 6 island-hospitals. Among them, 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 for DSH (88.7%). The CF of self-harm reported in these hospitals ranged from 6.0% to 50.0% (mean ± sd, 13.3% ± 15.0). Crude and adjusted analysis identified association with determinants of mortality for DSH admissions. The age group 55-64 years was at highest risk of death from DSH and younger patients (15 - 24 year age group) were at lowest risk. The higher lethality of DSH from pesticide ingestion compared with other methods was suggestive but not significant. CF within the region was variable but high compared to industrialised nations. Case records and management of DSH were poor. An effective DSH prevention programme in the Sundarban region requires a better DSH surveillance system at clinical facilities and an intersectoral approach, linking the agricultural interests of pesticide safety and mental health interests for preventing DSH.

Key words: DSH, suicide, pesticide, mental health, Sundarban

Introduction

Non-fatal deliberate self-harm (DSH) and suicides particularly with pesticides are serious global health problems in many low-and middle-income countries (Gunnell & Eddleston 2003; Eddleston & Phillips, 2004). The same has been reported from studies conducted in different regions of India (Bose *et al.* 1999; Gautami *et al.* 2001; Mohanty *et al.* 2004; Srinivas *et al.* 2005, Fleischmann *et al.* 2005). Albeit, pesticides contribute substantially to public health by limiting the spread of certain vector-borne diseases (van der Hoek *et al.* 1998) and agricultural development, nonetheless, they have deleterious effects on health and environment as well (Pimentel, 1996). Serious hazards of pesticide use and misuse include accidental, occupational and deliberate poisoning.

An estimated 3,000,000 people are hospitalised for pesticide poisoning each year throughout the world, resulting in 7.3% mortality among them (Jeyaratnam, 1990). Most of this morbidity and mortality is due to intentional self-poisoning. Due to lack of a uniform global surveillance system, however, there are no precise data for occupational, accidental or deliberate self-poisoning (Konradsen *et al.* 2005). Although more than 85.0% of the 815,000 global suicides in 2000 occurred in low-and middle-income countries (Peden *et al.* 2002), reports and documentation of the epidemiology of DSH and suicide from more remote rural communities, like those of the Sundarban region in West Bengal, India, are mostly unavailable.

Straddling Bangladesh and India, the Indian Sundarban region is located at the southernmost tip of the state of West Bengal and covers an area of 9,630 sq. km (Naskar, 1998). It is an underdeveloped region comprising both island and mainland community development blocks (CDBs), which are the lowest-level administrative units in this rural region. These blocks have a population of 150,000 to 200,000. Geographical remoteness, low agricultural yield due to high soil salinity, ecological vulnerability from unpredictable weather conditions, dearth of industry, limited health facilities make this area one of the most disadvantaged regions of West Bengal (Chowdhury *et al.* 2001). Nearly half of the families in the

region (41.3%) live below the poverty line (i.e., a family earning less than Rs. 1000, or US$ 21.70 per month). Agriculture is the primary occupation for 85.0% of the population (Ganguly, 2005) and pesticides are extensively used for cultivation (Chowdhury *et al.* 1999).

Community mental health research in the Sundarban region previously identified widespread concerns about pesticide-ingested DSH and suicide and the lack of effective treatment to prevent avoidable mortality (Chowdhury *et al.* 2003; Chowdhury *et al.* 2004). To document the burden of DSH and suicide, clinical epidemiological research was carried out in 6 island blocks. From east to west, they are Gosaba, Basanti, Kultali, Patharpratima Namkhana, and Sagar (Fig. 1).

Fig. 1 here

Methods

Study Site

Research activities were planned in 6 island blocks of the Sundarban region. The total population in these 6 islands is 1,142,686 (Census, 2001).

A Block Primary Health Centre (BPHC) is the main clinical facility in each of these blocks, typically with 15-30 inpatient beds, providing both outpatient and inpatient services. There is one block medical officer (BMOH) and 1-3 medical officers (MO), apart from 5-8 nurses. Staff also includes, health assistants (20-50) and community health guides (5-10) who work in the community. These BPHCs are overstretched beyond their capabilities, and they usually lack adequate resources including infrastructure (ICU, ventilator) and expertise to manage cases of poisoning. Moreover, they have insufficient atropine and PAM (Pyridine aldoxime methiodide), the antidotes required for treating most cases of pesticide poisoning.

Data collection

Information about DSH and suicide from 1 January 1999 to 31 December 2001 was collected from retrospective documentation, based on manual review of admission and emergency registers of the 6 BPHCs. The purpose of the study was communicated to the BMOH (block medical officersof health) in advance and data were collected in two phases. During the first phase, each BPHC was visited for a 2-week period to identify DSH cases in patient registers, extracted from the general clinic register. The hospitals did not maintain separate registers to record self-harm. Gosaba, Kultali and Patharpratima, however, maintained additional registers for emergencies and poisoning, which were also examined. A second visit was made after the data were tabulated and studied. Clarifications were sought for missing data in the registers, consulting the case history sheets for selected records.

Cases of DSH were identified and analysed for the 3-year period. The demographic characteristics, the method, for DSH, and resulting morbidity and mortality of patients above the age of 10 years were studied. For children under 10 years of age, it was assumed that pesticide poisoning was accidental rather that DSH.

Statistical Analysis

Data were analysed with Stata (Intercooled Standard version 8.0). DSH was the outcome variable having two levels, non-fatal deliberate self-harm and suicide. Patients with missing outcomes were excluded from the analysis. Bivariate logistic regressions was carried out to assess the relation between fatal outcome and individual variables sex, age groups, marital status, religion and method of self-harm. The model considered random effect at the hospital level to take into account possible correlation between study sites. A multivariate logistic regression model with backward stepwise selection was applied to identify the most significant risk factors for suicide. The removal level of covariates was taken to be at p=0.1, based on the likelihood ratio test.

In addition, a model was fitted for each hospital separately and results compared between hospitals. Case Fatality (CF) were also calculated for each of the 6 hospitals. The percentage of DSH clinic visits was calculated after deducting the estimated child (0-9 years) visits from the total BPHC admissions, based on an estimate of sampling every fifth page of the case registers (1999-2001) for the Namkhana BPHC. The distribution of age groups and sex was calculated for the same (n=354). The findings were then extrapolated to calculate the percentage of 0-9 year children in the other 5 hospitals. It was assumed that all BPHCs have a similar structure of patients with regard to age and sex classes and thus, the same proportion of children was deducted from total patient numbers.

Results

A total of 1,277 DSH patients (405 in 1999, 433 in 2000 and 439 in 2001) were admitted to the 6 BPHCs, of which 77.7% of patients (992) survived their attempt and 11.9% (152) died. The fate of the remaining 10.4% (133) cases was not recorded, and coded missing. The median age of the DSH patients was 24 years (range 10-95 years ± sd 11.9). In all the BPHCs men were consistently older than women. The median ages of women and men were 22 and 26 years respectively. Most (72.5%) of the patients were young adults (15-34 years). Nearly three quarters (72.2%) were married while a little more than a quarter (27.2%) was single. The vast majority of patients (90.9%) were Hindus, followed by Muslims and other religions.

The percentage of clinic visits for DSH among patients over 10 years of age varied among the different BPHCs, the highest at Patharpratima (14.8%) and the lowest at Gosaba (3.2%) (Table 1).

Table 1 here

More women than men were admitted to all 6 BPHCs for DSH (Table 2). The distribution of admissions for women and men were similar in all the BPHCs except Kultali, where female admissions were highest (75.2%). The difference between women and men DSH admissions in

the 6 hospitals was not significant (Fisher's exact test). Of the DSH patients, 65.2% were women and among the subset of suicides, 67.1% were women.

Table 2 here

Collectively, the CF (± sd) was 13.3% (15.0) (Table 3). The highest CF was found in Basanti (50.0%) and the lowest in Kultali (5.8%).

Table 3 here

Pesticides were the most common method for self-harm, both for DSH and suicide (Table 4). Indigenous poisons including yellow oleander (*Thevetia peruviana*) and dhatura (*Datura stramonium*) were the next most frequently used for self-harm. For 5.1% patients, the type of poison was unknown.

The combined CF of all methods of DSH was 11.3%. The CF was the highest for pesticide ingestion and the lowest for indigenous poison intake.

Table 4 here

The variables associated with suicide are reported in table 5. The age group 55-64 years was at highest risk of death from DSH, and patients in the 15 - 24 year age group were at lowest risk. The higher lethality of DSH from pesticide ingestion compared with other methods was suggestive, but not significant.

Table 5 here

Discussion

This study clarified the clinical epidemiology of DSH and suicide with pesticides in 6 islands of the Sundarban region, India. Findings are notable with respect to four important issues: variable but substantial clinical burden of DSH, high frequency of pesticides as the means of DSH, high and variable CF and poor quality of DSH and suicide data in the BPHCs.

Substantial clinical burden of DSH

DSH was responsible for more than 5.0% of clinic consultations in these 6 centres. Considerable differences in clinical rates of DSH at the different BPHCs were also noted. Our study did not distinguish different rates of DSH in the community from different levels of access to care owing to the location of the BPHCs and the health-seeking behaviour of the local population. With respect to help-seeking behaviour, it was noted that people travel from coastal areas to urban towns for medical assistance. In Patharpratima, the BPHC is situated at the northern end of the island and transportation out of the island is limited and difficult. Thus, patients here are compelled to seek help from the BPHC only. This is also true for Kultali.

On Sagar Island, the BPHC is easily accessible to most people because of its central location. However, many patients, especially in the northern part of the island preferred to attend a mainland district-level hospital, where they expect to receive better treatment. Basanti, Gosaba and Namkhana islands are divided by rivers into 2 major segments (north and south), and the BPHCs are located in the southern sector. Residents of the northern sector of these islands less frequently use services of the local BPHCs, since they have easier access to sub-divisional or district hospitals. Consequently, the magnitude of the identified clinical burden of DSH identified in our study should be regarded as a conservative assessment of the problem in the community.

It is also notable that the rates of both DSH and suicide were higher for women at all six sites. The gender aspect of suicidal behaviour requires more attention in the region.

Frequent use of pesticides for DSH

Pesticide poisoning was the method of self-harm for most hospital DSH admissions. Previous research in the region (Chowdhury *et al.* 2003; Chowdhury *et al.* 2004; Chowdhury *et al.* 2007) and other studies in low-and middle-income countries emphasise the role of pesticides as the method of choice for DSH and suicide (Phillips *et al.* 2002; Moghadamnia & Abdollahi, 2002; Gunnell & Eddleston, 2003; Kalkan *et al.* 2003; Nesime *et al.* 2004; Thanh *et al.* 2005).

Approaches to reducing deaths from pesticide poisoning include development of alternatives to agricultural pesticides. One such approach is Integrated Pest Management (IPM),

Improving storage facilities. Reducing toxicity, adding emetic agents to all pesticide products and access for impulsive self-harm are cornerstones of prevention strategies (Gunnell & Frankel, 1994; Roberts *et al.* 2003). A study conducted in Samoa (formerly Western Samoa) showed that Paraquat-related suicide rates declined after its partial restriction (Bowles, 1995).

For suicide prevention it is also important to increase public awareness of mental health and to recognise the socio-cultural contexts in which pesticides are consumed (Chowdhury & Weiss, 2004). Intersectoral strategies that combine regulatory activities to minimise impulsive access to hazardous pesticides and to acknowledge the role of mental health problems, psychosocial contexts and stressors that lead to DSH and suicide should guide health policy and community actions.

High and variable Case Fatality Rates

The CF of DSH in the study BPHCs was higher than in most industrialised countries, which are typically less than 1.0% (Gunnell & Murray, 2004). The CF for poisoning in low-income countries, on the other hand, is far higher than 10.0%, (Eddleston, 2000; Hettiarachchi & Kodithuwakku, 1989 a & b; Gunnell & Eddleston, 2003). The substances consumed in overdose in high-income settings are prescribed or non-prescription drugs that are less toxic than lethal pesticides. Other factors, such as proximity to the health centre, the availability of medical intervention and antidotes (Eddleston *et al.* 1998), and an absence of uniform management guidelines to treat self-harm patients also contribute to the higher CFRs in low-income countries.

CFs indicate the need to improve case management in the BPHCs, particularly in Basanti, where rates were highest. Kultali and Patharpratima, which were better equipped, had lower fatality rates. Both clinical training and resources to make use of clinical skills are needed. Site-specific monitoring of CF is also required to identify problems, support efforts to acquire needed resources and to track the impact of improved services. Establishing guidelines to manage self-harm patients, training medical personnel, and ensuring the availability of cheap

antidotes in households and BPHCs are appropriate measures that will reduce pesticide mortality.

Poor quality of DSH and suicide data in the BPHCs

In this study, the outcome for 10.0% of the DSH patients was not recorded. This represents another aspect of health system problems and neglect of mental health priorities contributing to the poor quality of DSH and suicide mortality data (Bertolote & Fleischmann, 2002). Improved surveillance for DSH and pesticide poisoning requires developing standards for documenting DSH and suicide and training medical staff to maintain records. Because there was no such system, a DSH register was developed for this study. These registers were distributed in all the 13 Sundarban BPHCs to establish a uniform DSH surveillance system in the region. Our training of BPHC personnel for this study is also intended to facilitate sustained surveillance from improved clinical data in the region.

Although this study is one of the sources of information about the clinical epidemiology of DSH and suicide in the 6 islands of the Sundarban region, certain limitations are also acknowledged. Because many DSH patients do not reach medical facilities and only the serious cases seek help from the BPHC, clinic-based DSH data provide conservative estimates of the community burden. Furthermore, since it was not possible to make a crude estimate of the number of people seeking help outside their designated health centres the study did not estimate a crude incidence of self-harm based on hospital admissions as this would question the validity of the data. Further research on the other types of health care services used by self-harm patients, community surveys of DSH and suicide and development of a regular surveillance system in all the blocks of the region are required for a more comprehensive and accurate account of the problem. The nature of data recording made it impossible to include certain explanatory variables in the analysis which acted as confounders thereby weakening the assertions made.

This study has documented the nature and significance of DSH in an agricultural Indian community, showing that it is typically neglected but a substantial clinical and public health problem. We have suggested measures to improve the CF of pesticide poisoning with improved supplies, training of health staff, community awareness and access to services. The agricultural department should be involved in campaigns promoting safe pesticide practices throughout the region. This study also indicates the need for intersectoral programmes linking health and agricultural departments to ameliorate the problem of DSH with pesticides and to reduce mortality from all types of pesticide poisoning, both accidental and intentional. Intersectoral systems-oriented approaches to DSH and suicide are needed for effective prevention strategies in India and settings elsewhere where pesticide-related DSH and suicide are important public health problems.

References

Bertolote JM & Fleischmann A (2002) A global perspective in the epidemiology of suicide. *Suicidologi* **2,** 6-8

Bose TK, Basu RK, Biswas B, *et al.* (1999) Cardiovascular effects of yellow oleander ingestion. *Journal of Indian Medical Association* **97(10),** 407-410.

Bowles JR (1995) Suicide in Western Samoa. An example of a suicide prevention program in a developing country. In: *Preventative strategies on suicide*. (ed RFW Diekstra) Leiden, E. J. Brill; pp. 173-206

Census (2001) Office of the Director of Census Operations, West Bengal. A census view. Series 20, South 24 Parganas. Kolkata.

Chowdhury AN, Chowdhury S, & Chakraborty A (1999) Eco-stress, quality of life and mental health in Sundarban delta of India. *International Medical Journal (Japan)* **6,** 59-63

Chowdhury AN, Chakraborty AK, & Weiss MG (2001) Community mental health and concepts of mental illness in the Sundarban Delta of West Bengal, India. *Anthropology & Medicine* **8(1),** 109-129

Chowdhury AN, Sanyal D, Dutta SK *et al.* (2003) Deliberate Self-Harm by Ingestion of Poisons on Sagar Island in the Sundarban Delta, India. *International Medical Journal (Japan)* **10(2),** 85-91

Chowdhury AN, Shasmal R, Dutta SK *et al.* (2004) Ethnographic Survey of Deliberate Self-Harm in Some Villages of Sundarban Delta, West Bengal. *Journal of Indian Anthropological Society* **39,** 173-182

Chowdhury AN & Weiss MG (2004) Ecostress and mental health in Sundarban Delta, India. In: *The dying earth: people's action and nature's reaction.* (eds M Desai & MK Raha) ACB Publications with Netaji Institute for Asian Studies Kolkata pp.108-119

Chowdhury AN, Banerjee S, Brahma A, *et al.* (2007) Pesticide poisoning in non-fatal deliberate self-harm: A public health issue. *Indian Journal of Psychiatry* **49,** 117-120

Eddleston M & Phillips MR (2004) Self poisoning with pesticides. *British Medical Journal* **328,** 42-44

Eddleston M (2000) Patterns and problems of deliberate self-poisoning in the developing world. *Quarterly Journal of Medicine* **93,** 715-731.

Eddleston M, Sheriff MH, & Hawton K (1998) Deliberate self harm in Sri Lanka: an overlooked tragedy in the developing world. *British Medical Journal* **317,** 133-135.

Fleischmann A, Bertolote JM, De Leo D *et al.* (2005) Characteristics of attempted suicides seen in emergency-care settings of general hospitals in eight low-and middle-income countries. *Psychological Medicine* **35(10),** 1467-1474

Ganguly K (2005) Beauties of Sundarban. In: *Sreekhanda Sundarban* (ed B Jana) Abc printers Kolkata pp. 3-6

Gautami S, Sudershan RV, Bhat RV, *et al.* (2001) Chemical poisoning in three Telengana districts of Andhra Pradesh. *Forensic Science International* **122,** 167-171

Gunnell D & Frankel S (1994) Prevention of suicide: aspirations and evidence. *British Medical Journal* **308,** 1227-1233

Gunnell D & Eddleston M (2003) Suicide by intentional ingestion of pesticides: a continuing tragedy in developing countries. *International Journal of Epidemiology* **32,** 902-909.

Gunnell D, Ho D & Murray V (2004) Medical management of deliberate drug overdose: a neglected area for suicide prevention? *Emergency Medicine Journal* **21,** 35-38.

Hettiarachchi J & Kodithuwakku GC (1989a) Self-poisoning in Sri Lanka: factors determining the choice of the poisoning agents. *Human Toxicology* **8,** 507-510.

Hettiarachchi J & Kodithuwakku GC (1989b) Pattern of poisoning in rural Sri Lanka. *International Journal of Epidemiology* **18,** 418-422.

Jeyaratnam J (1990) Acute pesticide poisoning: a major global health problem. *World Health Statistical Quarterly* **43,** 139-144

Kalkan S, Erdogan A, Aygoren O *et al.* (2003) Pesticide poisonings reported to the drug and poison information center in Izmir, Turkey. *Veterinary & Human Toxicology* **45,** 50-52.

Konradsen F, van der Hoek W, Gunnell D *et al* (2005) Missing deaths from pesticide self-poisoning at the IFCS Forum IV. *Bulletin of the World Health Organisation* **83,** 157-158

Moghadamnia AA & Abdollahi M (2002) An epidemiological study of poisoning in northern Islamic Republic of Iran. *East Mediterranean Health Journal* **8,** 88-94.

Mohanty M, Kumar V, Bastia B *et al.* (2004) An analysis of poisoning deaths in Manipal, India. *Veterinary & Human Toxicology* **46,** 208-209.

Naskar KR (1998) Indian Sundarban and the mangroves. West Bengal State Book Bureau, Kolkata

Nesime Y, Lokman B, Akif IM *et al.* (2004) Acute pesticide poisoning related deaths in Turkey. *Veterinary & Human Toxicology* **46,** 342-344.

Peden M, McGee K, & Sharma G. (2002) The injury chart book: a graphical overview of the global burden of injuries. World Health Organisation, Geneva.

Phillips MR, Li X, Zhang Y (2002) Suicide rates in China, 1995–99. *Lancet* **359**, 835-840.

Pimentel D (1996) Green revolution agriculture and chemical hazards. *The Science of the Total Environment* **Suppl.1,** S86-S98

Roberts DM, Karunarathna A, Buckley NA *et al.* (2003) Influence of pesticide regulation on acute poisoning deaths in Sri Lanka. *Bulletin of the World Health Organisation* **81,** 789-798.

Srinivas RC, Venkateswarlu V, Surender T *et al* (2005) Pesticide poisoning in south India: opportunities for prevention and improved medical management. *Tropical .Medicine & International Health* **10,** 581-588.

Tang S, Xiao Y, Chen Lansun *et al.* (2005) Integrated pest management models and their dynamical behaviour. *Bulletin of Mathematical Biology.* **67(1),** 115-35.

Thanh TTH, Jiang G-X, Van TN *et al.* (2005) Attempted suicide in Hanoi, Vietnam. *Social Psychiatry & Psychiatric Epidemiology* **40,** 64-71

van der Hoek W, Konradsen F, Athukorala K *et al.* (1998) Pesticide poisoning: a major health problem in Sri Lanka. *Social Science and Medicine* **46**, 495-504

Fig. 1: **Sundarban region of West Bengal, India**

Table 1: Percentage of clinical consultations for DSH among patients 10 years-of-age or older in the 6 Block Primary Health Centres during 1999-2001

BPHCs	*Admissions ≥ 10 years*	*DSH*	*%*
Basanti	846	48	5.7
Gosaba	2889	91	3.2
Kultali	1484	161	10.8
Namkhana	5650	322	5.7
Patharpratima	1950	289	14.8
Sagar	6584	366	5.6
Total	19403	1277	6.6

Table 2: DSH Admissions and mortality in the 6 Block Primary Health Centres during 1999-2001

BPHCs	All self-harm			Non-fatal DSH				Suicide				Uncertain			
	T	F %	M %	T	%*	F %	M %	T	%*	F %	M %	T	%*	F %	M %
Basanti	48	64.6	35.4	24	50.0	62.5	37.5	24	50.0	66.7	33.3	0	0.0	0.0	0.0
Gosaba	91	61.5	38.5	74	81.3	60.8	39.2	9	9.9	55.6	44.4	8	8.8	75.0	25.0
Kultali	161	75.2	24.8	130	80.7	75.4	24.6	8	5.0	87.5	12.5	23	14.3	69.6	30.4
Namkhana	322	61.5	38.5	251	78.0	63.7	36.3	40	12.4	60.0	40.0	31	9.6	45.2	54.8
Patharpratima	289	64.4	35.6	249	86.2	64.7	35.3	24	8.3	83.3	16.7	16	5.5	31.3	68.7
Sagar	366	62.6	37.4	264	72.1	63.6	36.4	47	12.8	63.8	36.2	55	15.0	56.4	43.6
Total	1,277	64.3	35.7	992	77.7	65.2	34.8	152	11.9	67.1	32.9	133	10.4	54.1	45.9

* Percentage of admissions for non-fatal DSH and suicide, and DSH with uncertain outcome

Table 3: Case fatality (CF) for DSH in the 6 Block Primary Health Centres during 1999-2001

BPHCs	Cases	Suicides	CFR (%)
Basanti	48	24	50.0
Gosaba	83	9	10.8
Kultali	138	8	5.8
Namkhana	291	40	13.7
Patharpratima	273	24	8.8
Sagar	311	47	15.1
All sites	1,144	152	13.3

Table: 4 Methods used by patients to attempt self-harm

Methods	Total	%	DSH	%	Suicide	%	CFR
Pesticides	1015	88.7	877	88.4	138	90.8	13.6
Indigenous Poisons	33	2.9	30	3.0	3	2.0	9.1
Other	38	3.3	34	3.4	4	2.6	10.5
Unknown Poison	58	5.1	51	5.1	7	4.6	12.1
All methods	1,144*	100.0	992	100.0	152	100.0	13.3**

* Patients with uncertain outcome (n=133) was excluded from the calculation

** Crude mean CFR of all methods

Table: **5 Determinants of mortality from deliberate self-harm. (n=1144)**

Variables	Bivariate Analysis			Multivariate Analysis		
	OR	**95% CI**	**P value***	**OR**	**95% CI**	**P value***
Age (n)			0.0003			0.007
15-24 yrs (525)	**1.0**	-		**1.0**	-	
10-14 yrs (82)	0.17	0.40-0.71		0.2	0.03-0.78	
25-34 yrs (313)	1.21	0.76-1.91		1.3	0.82-2.19	
35-44 yrs (118)	0.86	0.45-1.66		0.9	0.48-1.95	
45-54 yrs (54)	2.22	0.99-4.97		2.6	1.20-5.44	
55-64 yrs (26)	2.78	1.04-7.39		2.7	0.96-7.46	
> 65 yrs (26)	1.72	0.61-4.81		2.0	0.67-5.93	
Sex (n)			0.155			0.17
Female (749)	**1.0**	-		**1.0**	-	
Male (395)	0.87	0.60-1.26		0.8	0.49-1.13	
Marital status (n)			0.006			0.73
Married (838)	**1.0**	-		**1.0**	-	
Single (299)	0.55	0.35-0.87		0.9	0.53-1.68	
Others (7)	3.04	0.63-14.50		2.0	0.34-11.80	
Religion (n)			0.105			0.14
Hindu (1041)	**1.0**	-		**1.0**	-	
Islam (101)	0.68	0.35-1.34		0.7	0.37-1.48	
Others (2)	6.94	0.40-119.69		20.37	1.01-409.33	
Method (n)			0.056			0.09
Pesticide (1015)	**1.0**	-		**1.0**	-	
Non-pesticide (129)	1.60	0.87-2.91		1.66	0.89-3.06	

* p- value calculated for the grouped variable

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