A prospective study of suicidal behaviour in Sundarban delta, West Bengal, India

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ABSTRACT

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 non-fatal, 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.

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INTRODUCTION

Deliberate self-harm (DSH), both fatal and non-fatal, is a challenging public health issue. Fatal DSH (suicide) caused about 54% of all violent deaths globally in 2002 and more people died by committing suicide than due to homicides (34.5%) and wars (10.6%) combined.[1] There is a paucity of published data on non-fatal DSH in the literature. A survey of the English language literature from 1970 to 2000 showed that the 1-year incidence rates from population surveys of non-fatal DSH ranged from 700 to 1100 per 100 000 population and the life-time prevalence rate ranged from 720 to 5930 per 100 000 population.[2] Non-fatal DSH is 10 times more common than completed suicide.[3]

In India about 100 000 persons commit suicide every year, contributing to about 10% of suicides in the world.[4] Suicide is among the top 10 causes of death in India and the top 3 causes of death in those between 16 and 35 years of age.[5] The national suicide rate for 2001 was 10.6 per 100 000 population, a 14.5% increase from 1991.[5] There are considerable regional differences in the rates of suicide (per 100 000 population) in different parts of India over different time periods—30.1 from Kerala,[6] 22.8 from Warrangal,[7] 29 from Jhansi,[8] 95.2 from Tamil Nadu,[9] 69 from southern India[10] and 43.4 from West Bengal.[11] A systematic study of non-fatal DSH from India is lacking. It is estimated that the incidence of non-fatal DSH is 250 per 100 000 persons per year.[12] Indian research on DSH[13–19] has shown that various sociocultural and environmental factors are associated with suicidal behaviour, thereby highlighting the importance of community-based psychosocial intervention. Suicidal deaths are preventable if sufficient knowledge and understanding of this maladaptive behaviour can lead to timely intervention. This study aimed to understand DSH behaviour, both fatal and non-fatal, at the primary care setting in the Sundarban delta region.

Sundarban is the southern coastal region of West Bengal (and neighbouring Bangladesh) and is the largest delta in the world. The West Bengal portion comprises 19 community developmental blocks—13 in the district of South 24 Parganas and 6 in North 24 Parganas. Each block has one main clinical facility: the block primary health centre (PHC). The ecological character of this region is responsible for its remoteness, backwardness and psychosocial stresses.[20] There are 54 islands intersected by numerous canals and tidal creeks. Human habitation has to be protected by man-made earthen embankments over 3500 km in length. A majority (88.5%) of inhabitants depend on agriculture

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for their livelihood. Soil erosion, tidal inrush of seawater and frequent climatic insults pose a constant threat to the lives and property of the people. The literacy rate and per capita income is much lower than the state average.[21]

In recent years, pesticide-related DSH, both fatal (suicide) and non-fatal, was recognized as a public health issue in the Sundarban region.[22,23] We planned a prospective study of subjects of DSH (both fatal and non-fatal) admitted to all 13 block PHCs of the Sundarban region under South 24 Parganas district. We aimed to assess the morbidity and mortality patterns and examine the underlying demographic and psychosocial factors. This study was part of a broader agenda to develop a community-based mental health programme for the region.[24,25]

METHODS

DSH register

The study protocol was prepared at the Institute of Psychiatry, Kolkata and was approved by the institutional ethics committee. To ensure complete and correct capture of data from DSH (both fatal and non-fatal) subjects attending the block PHCs, a separate DSH register was designed. The register consisted of 20-item case history sheets in Bengali, the local language. Item numbers 1–8 related to the demographic data, 9–15 to the DSH event (e.g. item 9 pertained to assessment of DSH and its perceived seriousness by patient/family and the attending physician, item 12 to the method of DSH) and, items 15–20 to the reasons for the DSH attempt, as stated by the patient or next of kin. Medical officers and nursing staff of each PHC were selected and trained at the Institute of Psychiatry in the process of recording data in the DSH register. To supervise the data collection and examine/interview some of the inpatients, the research team planned to visit each block PHC at least once a month.

Sample

All subjects above 6 years of age with DSH (both fatal and non-fatal) admitted from 1 January to 31 December 2002 in all 13 block PHCs, were included in the study. Whether a case brought to the block PHC was due to DSH, accidental or homicidal, was decided by the block medical officer. In all cases a confirmation was obtained from the subject, and in the fatal cases from their next of kin.

Data analysis

Proportions have been depicted with their 95% confidence intervals (CI) where relevant. The 95% CI for the incidence rates have been calculated assuming a Poisson distribution for the events. Numerical data have been compared between independent subgroups by Student independent samples *t* test. Categorical data have been compared by the Fisher exact test or chi-square test with Yates' continuity correction as appropriate. A two-sided p value <0.05 was considered statistically significant.

The outcome of a DSH attempt is of prime importance. Clinical prognostic factors of any given DSH attempt are well known, and many factors (e.g. past history of DSH attempt), which may not seem to be of direct clinical relevance, have been shown to exert some influence on the outcome. Such factors, along with age and gender, were explored in a logistic regression analysis, treating outcome as a categorical dichotomous variable (favourable or unfavourable). The aim was to assess the relevance of various factors simultaneously. For the purpose of logistic regression, the outcome of DSH attempt was coded as 0=poor outcome (i.e. death, referral to higher level care or discharge against medical advice) and 1=good outcome (i.e. discharge). All variables were entered into the regression model in one block.

RESULTS

A total of 1614 subjects of DSH—men 619 (38.4%) and women 995 (61.7%)—were admitted to the 13 block PHCs during the study period, of which 143 (62 men, 81 women) died. The gender difference in case-fatality was not significant. The mean (SD) age of cases of DSH was 26.2 (11.75) years (range 7–80 years). Women were younger (24.2 [10.18] years) compared with men (29.3 [13.32] years; p<0.001). The majority of patients were Hindus (77.3%), followed by Muslims (22.5%) and Christians (0.2%).

The educational attainment of the patients was low with 32.2% being illiterate and 35% having only primary education. Significantly more women were illiterate compared with men (39.5% *v*. 20.5%; p<0.001). A majority of men were agricultural labourers (30.9%) or farmers (14.1 %), whereas a majority of women (85.1%) had no formal occupation; 11.5% men and 10.1% women were students. Fishing was an exclusively male occupation. The observed gender difference in the distribution of occupations was highly significant (p<0.001). A majority of patients were married, with the difference in married–unmarried proportion between men and women being statistically significant (p=0.015; Table I). The month-wise hospital attendance of the subjects in the study year showed that women outnumbered men throughout the year. The highest number of cases was seen in April and May in both sexes (26.5% men, 20.8% women) and the difference between the sexes was not significant.

TABLE I. Profile of the study subjects

Profile	Men (*n*=619)	Women (*n*=995)	Total (*n*=1614)
Education			
Illiterate	127 (20.5)	393 (39.5)	520 (32.2)
Can sign	118 (19.1)	175 (17.6)	293 (18.2)
Primary	238 (38.5)	327 (32.9)	565 (35.0)
Secondary	111 (17.9)	96 (9.7)	207 (12.8)
Higher secondary	20 (3.2)	4 (0.4)	24 (1.5)
College	4 (0.7)	–	4 (0.3)
Other	1 (0.2)	–	1 (0.1)
Occupation			
None or only housework	74 (12.0)	847 (85.1)	921 (57.1)
Agricultural labour	191 (30.9)	12 (1.2)	203 (12.6)
Farmer	87 (14.1)	4 (0.4)	91 (5.6)
Skilled labour	57 (9.2)	12 (1.2)	69 (4.3)
Fishing	23 (3.7)	–	23 (1.4)
Tiger prawn seed catcher	3 (0.5)	4 (0.4)	7 (0.4)
Business	62 (10.0)	2 (0.2)	64 (4.0)
Service	9 (1.5)	2 (0.2)	11 (0.7)
Student	71 (11.5)	100 (10.1)	171 (10.6)
Retired	5 (0.8)	–	5 (0.3)
Other	37 (6.0)	12 (1.2)	49 (3.0)
Marital status			
Unmarried	201 (32.5)	262 (26.3)	463 (28.7)
Married	415 (67.0)	715 (71.9)	1130 (70.0)
Widowed	1 (0.2)	9 (0.9)	10 (0.6)
Separated	1 (0.2)	5 (0.5)	6 (0.4)
Divorced	1 (0.2)	3 (0.3)	4 (0.3)
Remarried	–	1 (0.1)	1 (0.1)

Values in parentheses indicate percentages Farmers those who own land
Agricultural labour landless workers who are engaged in cultivation on payment

Poisoning was the most common method (98.4%) adopted by both the sexes. Hanging was marginally more common among men while burning was slightly more common among women. This difference between the sexes was not significant.

A small number of men (13.4%) and women (13.3%) had a past history of attempt at DSH. A family history of DSH was also present in a small proportion (11.8% men and 11.6% women) of subjects and in most cases there was a non-fatal DSH attempt (10.8%). A higher proportion of men had such a history (11.1%) compared with women (10.7%), whereas women showed a slight preponderance (0.9%) of fatal DSH compared with men (0.7%). However, these gender differences were not statistically significant (Table II).

A highly significant gender difference (p<0.001) was found in the choice of venue for DSH. Home was the preferred venue (92.8%), and even more so in women (96.1%) than in men (87.6%). The relative risk of women choosing the home environment rather than an outside place, compared with men, was 1.097 (95% CI 1.062–1.133). Regarding help-seeking behaviour, relatively few cases (12.6%) sought help after the DSH attempt. Though women (12.8%) showed a slightly higher proportion of help-seeking than men (12.3%), this difference was not significant.

Quarrel with spouse was the commonest cause in both the sexes (42.7%), followed by quarrel with guardians (26.6%), which was more common in men. Individually, these differences were significant. Failed love affairs accounted for a small and comparable proportion (3.2% men, 2.3% women) in the two groups. 'Other' causes included infertility, impotence, quarrel with other family members and political disputes. Overall, 78.8% of cases were discharged after treatment and 8.9% died. A higher fatality rate was seen among men (10%) compared with women (8.1%). Though the proportion of unfavourable outcomes (death, discharge against medical advice and referral to a higher level of care) was more in men, the gender difference in fatal outcome was not statistically significant (Table III).

In the logistic regression analysis (Table IV), the goodness of fit test statistic returned a value of p>0.05 [Hosmer and Lemeshow Goodness-of-Fit Test c^2=7.306, df=8, p=0.504], implying failure to reject the null hypothesis that there is no difference between the data and logistic regression model. This suggests that the model's estimates fit the data at an acceptable level. Age (younger patients had better outcome) and help-seeking (those seeking help were less likely to die) were significant variables in the model. In this multivariate analysis, gender, years of education, religion, marital status, past history, the place (home versus outside home) and method selected for the DSH attempt did not appear to influence the probability of a fatal outcome. The overall classification ability of the logistic regression model was 91.1%—it was excellent in its ability to predict a good outcome, but was poor in its ability to predict a poor outcome. This suggests that while good prognosis is markedly influenced by age and help-seeking, clinical factors may be more important for individual poor prognosis.

DISCUSSION

Though ecologically Sundarban differs widely from other Indian rural areas, the results show similarity with other Indian studies. The ratio of fatal to non-fatal DSH in our study was 1:10.3, which is slightly higher than that in other Indian reports.[14,26] In both sexes suicidal behaviour was more frequent among younger individuals as in other Indian studies[14,16] and women were younger than men, as has been reported earlier.[27] Our study also showed a preponderance for women. Though this finding is in agreement with some earlier studies,[22,28,29] the opposite has also been reported.[16,17,30] The majority of cases were Hindus and a low

TABLE II. Method and character of attempt at deliberate self-harm (DSH)

Item	Men (*n*=619)	Women (*n*=995)	Total (*n*=1614)	p value for gender difference
Method				p=0.316
Poisoning	609 (98.4)	979 (98.4)	1588 (98.4)	(χ^2=2.343, df=2)
Hanging	8 (1.3)	8 (0.8)	16 (1.0)	
Burning	2 (0.3)	8 (0.8)	10 (0.6)	
Past history of DSH				p=0.940
No	536 (86.6)	863 (86.7)	1399 (86.7)	
Yes	83 (13.4)	132 (13.3)	215 (13.3)	
Family history of DSH				p=0.936
No	546 (88.2)	880 (88.4)	1426 (88.4)	
Yes	73 (11.8)	115 (11.6)	188 (11.7)	
Venue				p<0.001
Outside home	77 (12.4)	39 (3.9)	116 (7.2)	
Inside home	542 (87.6)	956 (96.1)	1498 (92.8)	
Help-seeking				p=0.817
No	543 (87.7)	868 (87.2)	1411 (87.4)	
Yes	76 (12.3)	127 (12.8)	203 (12.6)	

Values in parentheses are percentages Two-sided p values from Fisher exact test except for 'Methods' where p value is from chi-square test with Yate's continuity correction Help-seeking those who wanted help for treatment after their attempt at DSH

TABLE III. Reasons and outcome of the attempt at deliberate self-harm (DSH)

Item	Men (*n*=619)	Women (*n*=995)	Total (*n*=1614)	p value for gender difference
Reason				p<0.001
Failure in examination	9 (1.5)	15 (1.5)	24 (1.5)	(χ^2=171.735, df=11)
Failure in love	20 (3.2)	23 (2.3)	43 (2.7)	
Unemployment	14 (2.3)	–	14 (0.9)	
Quarrel with guardian	193 (31.9)	236 (23.7)	429 (26.6)	
Quarrel with in-laws	11 (1.8)	118 (11.9)	129 (8.0)	
Quarrel with spouse	223 (36.0)	466 (46.8)	689 (42.7)	
Dowry demand	1 (0.1)	15 (1.5)	16 (1.0)	
Economic distress	61 (9.9)	10 (1.0)	71 (4.4)	
Chronic illness	24 (3.9)	20 (2.0)	44 (2.7)	
Bereavement	3 (0.5)	2 (0.2)	5 (0.3)	
Other	53 (8.7)	78 (7.8)	131 (8.1)	
Unknown	7 (1.1)	12 (1.2)	19 (1.2)	
Outcome				*p=0.027 (excluding absconded)
Discharged	465 (75.1)	806 (81.0)	1271 (78.8)	(χ^2=9.143, df=3)
DORB	48 (7.8)	66 (6.6)	114 (7.1)	
Referral	42 (6.8)	41 (4.1)	83 (5.1)	
Absconded	2 (0.3)	1 (0.1)	3 (0.2)	
Death	62 (10.0)	81 (8.1)	143 (8.9)	*p=0.208

Values in parentheses are percentages DORB discharge on risk bond, i.e. discharge against medical advice * Fatal *v.* non-fatal outcome, Fisher exact test 2-sided

TABLE IV. Logistic regression analysis assessing contribution of individual factors on outcome (fatal *v*. non-fatal) of attempt at deliberate self-harm (DSH)

Factor	B	SE	Wald	df	p value	Adjusted odds ratio	95% CI for odds ratio
Age	0.034	0.007	21.428	1	0.000	1.035	1.020–1.050
Education	0.073	0.087	0.699	1	0.403	1.076	0.907–1.276
Sex (male)	– 0.060	0.199	0.091	1	0.763	0.942	0.637–1.392
Religion (Hindu)	0.035	0.229	0.024	1	0.877	1.036	0.661–1.624
Marital status (married)	– 0.065	0.228	0.082	1	0.774	0.937	0.599–1.464
Venue (home)	– 0.404	0.311	1.694	1	0.193	0.667	0.363–1.227
Help-seeking (yes)	– 1.706	0.516	10.945	1	0.001	0.182	0.066–0.499
Past history of attempt at DSH (yes)	– 0.343	0.288	1.426	1	0.232	0.709	0.404–1.246
Mode of DSH			2.867	2	0.239		
Mode (poisoning)	0.784	0.657	1.426	1	0.232	2.190	0.605–7.930
Mode (hanging)	0.984	0.805	1.496	1	0.221	2.676	0.553–12.955

Wald Wald chi-square statistics CI confidence interval Age and education have been entered as numerical variables Reference category for each categorical variable is indicated in parentheses. Thus, risk is presented in males as compared to females, Hindus as compared to non-Hindus, married as compared to non-married, DSH attempt within the house as compared to outside, help-seeking immediately after the attempt as compared to no proactive help-seeking, positive past history of DSH attempt as compared to no past history. All variables have been entered together in the model, a good fit is indicated by the Hosmer and Lemeshow test.

incidence was evident among Muslims, and this may be due to a strong religious sentiment against DSH among Muslims.[31]

Low educational attainment (32.2% being illiterate) was common especially among women. Low education may influence decision-making and help-seeking and thus could be an important risk factor for DSH among women.[28,32] Most women were engaged only in housework (no formal occupation) and over 10% of men and women were students. A report from Himachal Pradesh also showed a high frequency of DSH attempt among housewives and students.[29] This subgroup probably warrants more attention at primary prevention.

Fatal and non-fatal DSH attempts were found to be more in married individuals (more common in women), a finding similar to that reported from other parts of India.[8,16] Through focus group discussions with housewives in Sundarban villages we elicited many stressful events. Married women were exposed to a variety of psychosocial stressors such as demands for dowry, need for hard physical labour (both domestic and in the field), lack of adequate privacy and recreational facilities, domestic violence related to alcohol abuse or extramarital affairs of the husbands. Separate interviews with some of the patients suggested physical and mental humiliation and torture by alcoholic husbands or in-laws that prompted them to DSH. Social support for women in general is inadequate, especially in rural areas. We believe that these factors have a strong role in enhancing vulnerability to DSH among married women.[33]

An excess of DSH cases were noted in April and May. Though women outnumbered men throughout the year, the number of men attempting suicide also peaked during this period. This seasonal trend for DSH points towards ecological factors, and participant observation and different focus group discussions revealed that the use of pesticides for agricultural work increases during this period. The easy availability of pesticides during these months, therefore, may have been a catalyst to the impulse of DSH in some cases. We found that poisoning was the most common mode of DSH irrespective of gender. Other studies of rural communities have reported similar findings.[14,34–36] Ignorance and carelessness about safe storage allows easy access to these lethal poisons in the household.[37] Availability and access to pesticides is a common risk factor for DSH in agricultural communities everywhere.[38,39]

Home was the most preferred location for DSH. Women made a higher proportion of attempts at home than men. This finding is in concurrence with other studies.[40,41] A possible reason may be that many patients did not want to die but were drawing attention (an impression obtained by us during clinical interviews of many subjects), so that they considered home a safe place to be discovered quickly and rescued.[42,43]

Marital disharmony and family conflict were the major triggers for attempted DSH in our study. Conflict with spouse was the commonest cause in both sexes followed by quarrel with guardians and in-laws. The most common causes of conflict were husband's alcohol abuse, abusive behaviour or extramarital affairs, or dowry or work-related conflicts with in-laws. This highlights the need for clinical attention to and counselling of subjects with familial maladjustment[36] because the cumulative effects of emotional stresses increase the vulnerability to DSH.[18,44–46] Some studies have delineated a positive role of psychosocial stressors among suicide victims.[47]

Most patients were discharged after treatment. There were more unfavourable outcomes among men. The uneventful recovery in a majority of women suggests that the attempt at DSH was impulsive and an attempt to escape from a crisis rather than an actual attempt at suicide.[48] Psychiatric assessment of a subsection of DSH attempters from three block PHCs supports this contention (reported elsewhere).[49]

The outcome of an attempt at DSH is of clinical importance. The logistic regression model explored the variables that could have an influence on outcome. The model appears to be good in its ability to predict a favourable outcome and emphasizes that good prognosis is markedly influenced by demographic and social factors.

Our study has limitations. All cases of DSH (fatal and non-fatal) in the study area were not necessarily brought to the block PHC. The obligation for legal reporting of DSH and the associated social stigma are causes of under-reporting,[50] the extent of which is unknown. In spite of our best efforts to collect complete data, some block PHCs did not perform optimally. This would have resulted in an error in the reported incidence of DSH. Lack of laboratory facilities in the study area prevented identification of the poison. The rates of non-fatal DSH obtained by us are the rates of subjects treated medically at government-based clinics.

Despite these limitations, our study identifies 3 important risk factors that need attention in suicide prevention. First, the psychosocial risk factors (young age, women, low educational attainment, marital status, interpersonal conflicts and domestic

violence) need to be dealt with using a community psychosocial intervention by the community health staff. This is an area where non-governmental organizations may also participate. Second, access to pesticides needs to be controlled and safe storage practised. The Panchayat and local agricultural extension workers can train farmers in the safe use and storage of pesticides as well as impose restrictions and control over the purchase and sale of pesticides. This would reduce access to these substances. Third, if the block PHCs are adequately equipped for emergency management of poisoning, then the fatality rate can be reduced. The block PHCs need to have a surveillance system for DSH cases so that the collective data will give valuable geographical information about the potential areas (type of poison, seasonal variation, issues of interpersonal conflicts, etc.) for intervention. This public health approach is practical and feasible for reducing the burden of DSH-related morbidity and mortality in the rural community.[51,52]

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