Characteristics of suicidal attempts among farmers in rural South India

Background: Globally, farming as an industry is considered a high-risk occupation for suicides. Certain states in India like Karnataka have a suicide rate higher than the national average, and this is generally attributed to the farmers’ suicide. Aims: The aim is to study the characteristics of suicidal attempts among the farmer community in South India, with special emphasis on gender differences, modes used, and the immediate precipitant causes. Materials and Methods: Retrospective, case register-based, explorative-descriptive study of 426 consecutive medicolegal case files of patients whose stated occupation was farming and who were admitted as cases of deliberate self-harm or suicide attempt to a rural tertiary care hospital in rural South India. Results: Out of the 426 farmers who attempted suicide, majority were male (355, 83.3%), in the age group of 21–40 years (318, 75%), married (358, 84%), and belonging to lower socioeconomic status (268, 62.9%). About 54% of them had attempted suicide by consuming pesticides (230). Surprisingly, 183 (43%) and 86 (20.2%) reported the immediate precipitant as being relationship issues and marital conflict, respectively, and only 100 (23.5%) attributed it to financial reasons. Females were significantly associated with a past history of suicidal attempt while males tended to abuse alcohol before an attempt more frequently. Conclusions: Pesticide poisoning was the most common mode for attempting suicide among the farmers. Contrary to public perception and other studies, relationship and marital issues, not financial reasons were found to be the most common immediate precipitant for the attempters in our study.

Keywords: Deliberate self-harm, pesticide poisoning, rural South India, suicidal attempt
hanging. Easy access to pesticides appeared to influence the geographic distribution of suicide in Taiwan. A survey conducted in the Indian subcontinent has shown that residing in a rural area and in South India, both of these factors were associated with an increased risk of suicide and that poisoning from pesticides (mainly organophosphorus compounds) used in agriculture was the leading cause of suicide in both men and women with hanging being the second most common cause.

Although farmers’ suicide has received a lot of media attention in India, there is scanty research on the topic of suicidal attempts among farmers, and with this study, our aims and objectives were to explore the characteristics of suicidal attempts, especially the gender differences, modes used, and the immediate precipitant causes among the farmer community in South India.

**MATERIALS AND METHODS**

All the data pertaining to medicolegal cases admitted with a diagnosis of attempted suicide or deliberate self-harm at a tertiary care hospital, catering to many rural districts in the southern state of Karnataka, India, from January 2013 to December 2015 were screened retrospectively. Among the 829 medicolegal cases identified as those with attempted suicide, 426 cases whose occupation was mentioned as farming or agriculture were analyzed and studied with regard to sociodemographic details, past and family history of suicidal behavior, alcohol abuse history, methods used to attempt suicide, and immediate precipitant. This cross-sectional, retrospective study with an explorative design was undertaken after obtaining due clearance from the institute's ethical committee. Descriptive statistical analysis was done using the Statistical Package for the Social Sciences (SPSS) for Windows, Version 16.0. (Chicago, SPSS Inc).

**Source and study population**

Source population were all the medicolegal cases admitted at a tertiary care hospital situated in rural South India. Of these medicolegal cases, those with a diagnosis of suicidal attempt or deliberate self-harm and belonging to the farming community were taken as the study population and reviewed. No face-to-face interview was conducted as it was retrospective case file review study.

**Inclusion criteria and exclusion criteria**

All farmer patients with a diagnosis of suicide attempt or deliberate self-harm who were admitted at Adichunchanagiri Institute and Hospital were included in the study. Since it was a retrospective study, those whose details were incomplete in the case registers were exempted from the study population.

**Sampling procedure**

Consecutive case registers were reviewed. A total of 829 inpatients’ files were suicidal attempt cases and were reviewed with a final farmer study population of 426.

**Data collection**

From the inpatient case records, data on sociodemographic characteristics such as age, sex, education, socioeconomic status, marital status, past and family history of suicidal behavior, alcohol abuse history, modes used to attempt suicide, and immediate precipitant cause were collected.

**Data analysis**

The collected data were checked for the completeness and consistency by investigators. After cleaning the data, descriptive measures such as means, frequencies, and percentages were calculated for all the variables which were related to the objectives of the study, such as sociodemographic details, methods employed, and immediate precipitants for attempting suicide. The various groups were compared using Chi-square test to check for statistically significant differences between them using SPSS version 16. Finally, the result was presented using text and tables.

**Ethical statement**

Ethical clearance was obtained from an ethical review board of Adichunchanagiri Institute of Medical Sciences. The case file information was de-identified during data collection and was coded.

**RESULTS**

The sociodemographic details of the farmers and the gender differences are given in Table 1. Information regarding the mode of suicide attempt and its immediate precipitant cause is depicted in Figures 1 and 2, respectively.

**Figure 1**: Modes of suicide attempts among male (n = 355) and female (n = 71) farmers ($\chi^2 = 42.30$ (4), $P < 0.001$)
Gender
Three hundred and fifty-five participants out of 426 belonged to the male sex (83.3%) making them an overwhelming majority. The male-to-female ratio among the attempters was 4:1.

Age
The overall mean age was 34.7 years with a standard deviation of 12 and range of 18–80 years. The mean age among males and females was 35 and 32 years, respectively. This information is depicted in Figure 3.

Marital status
There was a statistically significant association between gender and marital status in that males who were married were more likely to attempt suicide ($\chi^2 = 5.054 (1); P = 0.025$).

Socioeconomic status
As socioeconomic status improved, the frequency of suicide attempters sharply fell. A strong association was observed between gender and socioeconomic status ($\chi^2 = 17.178, P = 0.000$).

Past history of suicidal behavior
There was statistically significant gender difference ($\chi^2 = 7.612 (1), P = 0.006$) in that females were more likely to report past history of suicidal behavior.

Family history of suicidal behavior
There was no statistically significant difference between the genders.

Alcohol intoxication at the time of suicidal attempt
Males were significantly associated with alcohol abuse before the attempt ($\chi^2 = 6.428 (1), P = 0.01$).

Modes of suicidal attempt
Two hundred and thirty individuals (54%) had attempted suicide by ingesting pesticides of which 215 (overall 50.4%) had consumed organophosphorus compounds.

Table 1: Sociodemographic details and gender difference among the farmers

| Characteristics                      | Males (355; 83.3%), n (%) | Females (71; 16.7%), n (%) | Total (426), n (%) |
|--------------------------------------|---------------------------|----------------------------|-------------------|
| Age (years)                          |                           |                            |                   |
| 10-20                                | 5 (1.2)                   | 8 (1.9)                    | 13 (3.1)          |
| 21-30                                | 170 (39.9)                | 34 (8.0)                   | 204 (47.9)        |
| 31-40                                | 96 (22.5)                 | 18 (4.2)                   | 114 (26.8)        |
| 41-50                                | 45 (10.8)                 | 3 (0.7)                    | 48 (11.5)         |
| 51-60                                | 25 (5.9)                  | 3 (0.7)                    | 28 (6.6)          |
| >61                                  | 13 (3.1)                  | 5 (1.2)                    | 18 (4.2)          |
| Residential area                     |                           |                            |                   |
| Rural                                | 319 (74.9)                | 52 (12.2)                  | 371 (87.1)        |
| Urban                                | 36 (8.5)                  | 19 (4.5)                   | 55 (12.9)         |
| Marital status                       |                           |                            |                   |
| Single                               | 63 (14.8)                 | 5 (1.2)                    | 68 (16)           |
| Married                              | 292 (68.5)                | 66 (15.5)                  | 358 (84)          |
| Socioeconomic status                 |                           |                            |                   |
| Lower                                | 234 (54.9)                | 34 (8.0)                   | 268 (62.9)        |
| Middle                               | 109 (25.6)                | 27 (6.3)                   | 136 (31.9)        |
| Upper                                | 12 (2.8)                  | 10 (2.3)                   | 22 (5.2)          |
| Past history of suicidal attempt     |                           |                            |                   |
| Yes                                  | 55 (13.1)                 | 21 (4.9)                   | 77 (18.1)         |
| No                                   | 299 (70.2)                | 50 (11.7)                  | 349 (81.9)        |
| Family history of suicide/attempt    |                           |                            |                   |
| Yes                                  | 16 (3.8)                  | 3 (0.7)                    | 19 (4.5)          |
| No                                   | 339 (79.6)                | 68 (16)                    | 407 (95.5)        |
| Alcohol abuse at attempt             |                           |                            |                   |
| Yes                                  | 147 (34.5)                | 18 (4.2)                   | 165 (38.7)        |
| No                                   | 208 (48.8)                | 53 (12.4)                  | 261 (61.3)        |

$*$P < 0.05
Among these 230 individuals, only 20 (4.7%) were females. Other pesticides included endosulfans, herbicides, and fungicides. Seventy-two individuals (16.9%) had consumed unknown compounds, and since this was a retrospective study, no other details about these poisons could be obtained. The farming community has access to plant poisons, and possibly, these were some of the unknown compounds. Fifty-one individuals (12%) had used household agents such as bleach, phenol, rat poison, cockroach poison (Lakshman Rekha), kerosene, acid, and spirit. Forty-one of the attempters (9.6%) had overdosed on prescribed medicines, 20 of whom were females. Thirty-two individuals (7.5%) had attempted hanging. Among the 71 female attempters, only 20 (28% of the female attempters) had used pesticides while the remaining 51 had resorted to other means. Compared to the female attempters, 210 of the 355 male attempters had attempted poisoning by pesticides (59.1% of the male attempters). This gender difference in the mode of attempt was statistically significant \( \chi^2 = 42.308 \, (4); \, P < 0.01 \). None of the attempters in our sample had resorted to violent means such as self-immolation, drowning, electrocution, slashing or stabbing of body parts, jumping in front of railway, or oncoming vehicles or using firearms [Figure 1].

**Immediate precipitant**

Among our sample, relationship issues (183) and marital conflicts (86) together accounted for 63.5% as the immediate precipitant for the attempt. Financial reasons were reported by 100 individuals (23.5%), of which the majority (96) were male.

When analyzing the immediate precipitants for the male farmers, relationship issues, financial stressors, and marital conflicts were the leading causes accounting for 46.2%, 27%, and 15.2% among them. This was significantly different for the female farmers, whose leading precipitants were marital conflicts, relationship issues, and others accounting for 45.1%, 26.8%, and 21.1%, respectively [Figure 2].

**DISCUSSION**

The present study is an attempt to study the characteristics of suicidal attempts among the farmer population. We found a majority of the attempters to be male and in the age group of 21–40 years, married, and belonging to the lower socioeconomic status. Although completed suicides are supposed to be more common among men while attempted suicide is more common in women, we found a male-to-female ratio of 4:1 in our sample.

Findings of our study were largely similar to the Indian survey which noted that for suicide deaths at ages 15 or older, 40% of the suicide death in men and 56% of the suicide deaths in women occurred at ages 15–29 years.[10] Most other Indian studies on suicides as well as suicidal attempts have found an over-representation by those in their third and fourth decades.[1,4,11-14]

As per the government statistics, the overall male-to-female ratio of suicide victims in 2014 was almost 2:1. Among the Indian studies on attempters, most have reported an almost equal distribution of males and females in their samples[12,13,15] or a slight male preponderance,[14] though a West Bengal study has reported a female predominance among nonfatal pesticide poisoning.[16] However, a study done on suicides by the farmers of Maharashtra farmers’ showed a male-to-female ratio of 8.8:1, indicating that male sex among farmers might be a risk factor.[4] Our study too had a higher percentage of male farmers (83.3%) and male-to-female ratio of 4:1. This ratio might be influenced by reasons such as landholders are largely male in India, there might be a gender bias in seeking medical treatment, and though females might be employed seasonally as farmworkers, they might have stated their occupation as homemakers as this is not a regular employment.

As per government statistics, almost 66% of the suicide victims were married. Our study too resembled most other Indian studies which have shown a preponderance of married individuals among those attempting or committing suicide. When the gender difference was studied, married male farmers were more significantly associated with an attempt than married female farmers. This differs from the West Bengal study which reported more pesticide poisoning events among young married females.[16]

A systematic review of the association between socioeconomic position and suicide/attempted suicide in low- and middle-income countries in South and Southeast Asia found that lower socioeconomic position increases the likelihood of suicide/attempted suicide in these regions.[17] Our study had a similar finding, but we also noted a statistically significant association between gender and socioeconomic status in that male farmers belonging to lower socioeconomic status were more likely to attempt suicide.

Indian studies exploring past history of suicidal attempts have found varying overall percentages, ranging from 1.5% to 9% to 53.6%.[12,13,15] Our sample had an overall 18% with the previous attempt, and female farmers were more significantly associated with a past history.

While 4.5% of our farmer population had a positive family history, other Indian studies have shown percentages ranging from 1.5% to 13.3%.[12,13]
Alcohol abuse and suicidal behavior have a complex link. Disinhibition, impulsiveness, and impaired judgment arising out of alcohol abuse might lead to suicidal behavior, but alcohol might also be used to ease the distress associated with committing an act of suicide.\textsuperscript{[18]} Kar in his study found that 10.7% of the male attempters, 5.9% of the female attempters, and an overall 8% had consumed alcohol before the attempt\textsuperscript{[16]} while Das et al. reported that 17% of the attempters in their study had done so.\textsuperscript{[19]} Compared to these studies, we found a higher percentage among the farmers who had consumed alcohol before the attempt (38.7%) and a statistically significant association with the male gender.

Farmers tend to attempt suicide by methods to which they have easy access because of their occupation. Among European farmers, firearms were the method most frequently used by male farmers.\textsuperscript{[6,7]} Studies from Asia have found poisoning and hanging to be the most commonly used methods,\textsuperscript{[8]} and the Indian subcontinent is no different. A nationally representative survey found that poisoning from pesticides was responsible for 49% and 44% of suicides in men and women, respectively.\textsuperscript{[10]} A psychological autopsy study done on risk factors for farmers’ suicide in rural Maharashtra found pesticides as the mode of suicide in 68.37%\textsuperscript{[12]} while a community survey on nonfatal deliberate self-harm attempts in the Sunderbans, West Bengal, found organophosphate poisonings in 85.1%.\textsuperscript{[16]} Hanging follows pesticide poisoning as the most common method of suicide.\textsuperscript{[4,12]} Our study resembled most of the other Indian studies in that we found pesticide poisoning (54%) as the most common method among the farmers. The other modes of attempts were unknown compound poisoning (16.9%), household agent poisoning (12%), overdose of medicines (9.6%), and hanging (7.5%). As hanging has a more fatal outcome, most cases would result in a completed suicide rather than an attempted suicide. Gender differences with respect to mode of suicidal attempt were statistically significant in that male farmers were more likely to use pesticides. That pesticide poisoning was the most common method employed that might have public health implications for a mandate on implementing pesticide restriction. Research on poisoning suicide rates after launching of pesticide restriction interventions found no increase in the suicide rate using other methods.\textsuperscript{8,19} Community interventions such as pesticide lockers in every farming household and centralized communal storage of pesticides might need to be implemented.\textsuperscript{[20,21]}

Public perception is that indebtedness and financial stressors brought about majorly by unpredictable weather conditions drive the Indian farmer to suicide. The Vidarbha farmers’ psychological autopsy study found that the presence of stressful life events such as crop failure (53%), interpersonal problems (15%), physical illness (9%), and marriage of a female relative (6%) in the year preceding suicide strongly correlated to a completed suicide.\textsuperscript{[10]} The Vidarbha farmers perceived debt, addiction, environmental constraints, and poor prices as some of the causes leading to suicide.\textsuperscript{[22]} The Orissa study found that the life events such as major personal illness, family conflicts, marriage-related stressors, and financial loss (in descending order of relevance) were significantly higher in the suicidal attempt group than the controls.\textsuperscript{[12]} In the study by Das et al., 78% of the attempters reported a precipitant cause with 38% reporting it to be an interpersonal issue with someone other than spouse and 16.9% reporting a marital conflict.\textsuperscript{[13]} Another study found that psychosocial stress and social isolation rather than psychiatric morbidity were risk factors for suicide in rural South India.\textsuperscript{[23]} A review of suicide research from India found that socioeconomic factors rather than mental health problems are associated with farmer suicides with increased indebtedness playing a predominant role.\textsuperscript{[14]} Our study though focusing on the farmers was very different from the Vidarbha studies in that financial stressors was not the first but the third most common immediate precipitant. This was despite the fact that a majority of the attempters belonged to the lower socioeconomic status. It was interesting to note that relationship issues followed by financial stressors not being a leading precipitant might also be due to the geographical nature of the place as this area is relatively fertile and has not witnessed a drought in the near past unlike the Vidarbha region of Maharashtra. There were statistically significant differences between male and female farmers in that for the male farmers, relationship issues with a nonspouse other and for the female farmer, marital conflicts were the leading immediate precipitants. In a country like India where joint families which were the norm in agrarian societies are also undergoing transformations and slowly breaking, it is noteworthy that relationship issues with nonspouse others form an important stressor for the male farmers. The other interesting finding was that, contrary to public perception and other Indian studies, mainly from drought-struck Vidarbha, Maharashtra, which found that financial reasons were the main cause of farmers’ suicide, the most common immediate precipitants for a suicidal attempt in our study were relationship and marital issues, followed by financial reasons. Whether this is due to geographical variations or a fallout of the disintegrating social networks and breakup of traditional joint families into nuclear setups needs to be researched.

Limitations
Since this was a case register-based retrospective study, information on the intentionality of the attempts and
associated medical and psychiatric morbidity among the attempters could not be collected and assessed, and appropriate psychometric tools could not be applied. Future cross-sectional studies should address this by including scales to measure intentionality, lethality, stressors, and other related variables. Another limitation was that in this study, medicolegal cases registered at a tertiary care hospital were studied, and as there is an inherent under-reporting of suicidal attempts due to the stigma attached with it, compounded with gender bias in seeking medical care, these findings cannot be generalized to the general population.

CONCLUSION

In our study, we found that among the farmers belonging to this region, majority were male, married, belonging to the age group of 21–40 years, and lower socioeconomic status and residing in rural areas. Females were more significantly associated with past history of suicidal attempts while males had history of alcohol intoxication before the attempt. Poisoning, specifically pesticide poisoning was the most common method, accounting for more than half of all attempts. The most common immediate precipitant cause for both genders was relationship issues, but males and females significantly differed in that more males reported financial reasons while more females reported marital conflicts.

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Conflicts of interest

There are no conflicts of interest.

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