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Correlates of suicide attempts in young people in India – a case-control study of persons admitted to a hospital in Pune

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Abstract

Background Suicide attempts in young people in India are a major public health concern but the reasons for these remain unclear. The aim of this study was to explore factors associated with suicide attempts in persons aged 15–29 years in India.

Methods We conducted a matched case–control study at a public hospital in the urban region of Pimpri-Chinchward, Pune, between 2019 and 2023. 15–29-year-olds who were admitted to the hospital following a suicide attempt (cases) were compared with 151 outpatients who presented at the general medicine department of the same hospital (controls). We administered a comprehensive semi-structured interview to participants in both groups and analysed the data using cox regression models.

Results There were eight factors independently associated with suicide attempts. At the *individual-level*, these were: clinically significant depressive or anxiety symptoms over the last two weeks, previous suicide attempt, impulsivity, and low SES; alcohol use was significant only for males. Among the *social* factors, lack of exposure to suicide-related information in the last month, lack of social interactions over the last 12 months, and presence of interpersonal negative life events involving partners or family in the last 12 months were associated with suicide attempts. Descriptive data on life events revealed several relationship adversities, and the importance of acute interpersonal stressors in precipitating suicide attempts.

Conclusion A range of factors are associated with suicide attempts in young people in India which calls for a multifactorial approach towards suicide prevention.

Clinical trial number Not applicable.

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Keywords Suicide attempts, Case-control study, Young people, India

Introduction

Suicide is the third leading cause of mortality in young people worldwide [1]. In India, it has emerged as *the* principal cause of death in persons aged 15 to 29, surpassing fatalities from road accidents and infectious diseases [2, 3]. One in six deaths in this age group is attributable to suicide [3], and suicidal deaths in this population constitute about 35% of the suicides in the country [4]. Rates of suicide in young Indian men are twice the global average (25.5 vs 13.1 per 100,000) and rates in young Indian women are about six times higher (24.9 vs 4.1 per 100,000) [5]. India is home to the largest youth population in the world, with nearly 400 million people aged between 15 and 29 years [6], and the health of this population is therefore a key factor in the country's social and economic growth [7]. Yet, a young Indian dies by suicide every eight minutes, which represents an irreplaceable loss to their families and to the community.

Globally, suicide attempts are a robust predictor of subsequent death by suicide [8], and are serious problems in themselves, as they are associated with substantial medical, psychological and psychiatric comorbidities [9, 10]. In India, a previous suicide attempt is one of the most important risk factors for suicide [11], and studies show that survivors of attempts are also likely to experience hospitalisation, medical complications, psychiatric comorbidity, mental pain, social isolation and stigma [12, 13]. As elsewhere, it is estimated that there are at least 15 attempts for each death by suicide [14, 15], with studies suggesting even higher prevalences in young people [16–18]. Therefore, the identification of reasons for suicide attempts is essential to any suicide prevention efforts.

Available evidence suggests that factors associated with suicidal behaviour may be both universal and context specific. For example, while poor mental health is consistently reported as a risk factor, 80–90% of those with suicidality in high-income countries have a mental disorder, whereas this proportion is lesser than 50% in many parts of Asia [19]. Instead, negative life events (NLE) seem to be more relevant, particularly for persons without a psychiatric diagnosis [20]. The current data from India support this impression. For example, in a study of adolescents who had attempted suicide, only 38% had a psychiatric illness [21] and in another study, no individual had a previous or current psychiatric diagnosis except for adjustment disorder, whereas all had a stressor before the attempt [22]. Studies on young people from India have also reported the importance of other factors including: economic difficulties [22, 23], psychiatric conditions [16, 21, 23]; psychological distress [18, 24], emotional instability and poor impulse control [22–24]; and bullying and violence [16]. However, the existing literature has a number of limitations including inadequate coverage of risk factors relevant to young people, for example, substance use [25], exposure to suicide-related information [26], social media [27] and gaming [28]; lack of assessment of protective factors such as religiosity and social support; and small samples. This absence of a comprehensive understanding of the reasons for suicide attempts in young people in India is a barrier to developing contextually relevant and age-appropriate prevention strategies for this population.

We conducted a matched case-control study to identify factors associated with suicide attempts in young people aged 15–29 in India. To address the current gaps in information, we explored a wide range of variables, spanning both individual-level constructs *and* influences in the immediate social environment, which we based on an empirically derived model of suicidal behaviour from China [29, 30].

Methods

Setting

We conducted our study in the region of Pimpi-Chinchwad, in Pune city, which is located in the state of Maharashtra. This is a rapidly growing industrial hub, with a population of 2.5 million. The area had 224 suicides from just January to March 2025. Maharashtra has the largest proportion of suicides in the country, accounting for 13% of all suicides [4].

Recruitment of cases and controls

Field work was implemented between October 2019 and April 2023, at a 750-bedded public hospital that serves a primarily urban population of about 2 million. Trained research assistants (RAs) who are psychologists or psychiatric social workers (KM, AKS) recruited and interviewed participants. Cases were persons between 15 and 29 years of age who presented at the Department of Emergency with a suicide attempt. For the purpose of our study, we defined a suicide attempt as any 'non-lethal injury or poisoning that is self-inflicted' [29]. Cases were identified from entries made in the Department's medical records, which were prepared by a round-the-clock team of medical doctors, who take detailed history from the patient and accompanying relatives. Where medical records were unclear as to whether an injury or poisoning was self-inflicted or the individual presenting with suicidal behaviour denied their attempt, a detailed case narrative was prepared and the differential diagnosis of 'accident' or 'suicide attempt' was made by a mental health professional independent of the recruitment

process (MB, SP-YCMH or psychiatrists at the hospital). We only included in our study, persons who were subsequently *admitted* to a medical ward at the hospital. Persons who received only outpatient care; took discharge against medical advice; or were immediately referred to other hospitals were not included. Thus, our sample were significantly more likely to use lethal methods such as pesticide poisoning and hanging than those excluded (chi-sq = 95.041, *p* value= < 0.001). Inpatients were further eligible for participation if they spoke Marathi, Hindi or English, languages commonly spoken in Pune. They were excluded if they had cognitive, mental or physical conditions that impaired their capacity to participate, for example mental retardation, severe psychosis or extensive physical injuries. Details regarding the inclusion and exclusion criteria are provided in the study protocol [29].

Controls were identified from the same hospital, and were 15–29 olds who presented at the Department of General Medicine for other health problems. These were typically respiratory and other infections; complaints of headaches, pain, breathlessness, dizziness or weakness; and digestive problems. Some had more chronic ailments such as epilepsy, diabetes, blood pressure or endocrine problems, and others sought medical certificates or came for reviews. They were matched 1:1 to cases, on age group (15–19, 20–24, and 25–29 years) and gender. As with cases, controls were eligible to participate if they spoke the local languages and did not have serious medical complaints that impaired participation. Persons who were then hospitalised were excluded as they were likely to be more similar to cases, and their inclusion would have resulted in 'over-matching'. The selection of a control for a specific case took place only after the case's interview was completed. Informed consent was conducted with all patients and their families. Patients who agreed to participate provided written consent. If they were below 18 years of age, consent was obtained from their legal guardians.

Data collection

Each consenting individual participated in a 2-hour semi-structured interview, which opened with questions on demographics, followed by enquiries regarding the circumstances of the attempt (if applicable), and then the assessment of various factors. With the exception of three participants who we visited at their home, interviews were conducted in the hospital, in a private room at the Department of Psychiatry after participants had recovered from their ailments. They were audio-recorded if permitted by the participant. To maximise accurate recall of information (particularly for proximal factors), interviews were conducted within two weeks of patients leaving the hospital. Data was mostly collected using handheld tablets; some narrative data (for example, descriptions of NLE) were recorded on paper. Participants received Rupees 340 (5 $USD) upon completion of the interview. Upon completion of the interview, guidance was offered to prevent another attempt by employing strategies recommended by the WHO [31].

The questionnaire was developed based on the instrument used in the WHO SUPRE-MISS study [32] and guidance from experts on suicide (LV, MP). It underwent multiple revisions, which included checks for clarity and coherence from senior advisors (VP, SP), and tests of acceptability and feasibility in two pilot phases involving 62 patients. Standardised instruments were translated and back-translated following recommended procedures [33]. All RAs received six months of training, which included workshops with experts on instruments, in-house role plays, and pilot interviews with patients. During the study, they received regular supervision and support in the form of weekly meetings with their supervisor (MB) and peer supervision sessions. Further information of the recruitment and interview process are provided in the study protocol [29].

Measures

We considered factors from two broad domains.

Individual-level factors

Demographics. We included *marital status*; *employment status*; and *religion practiced*.

Psychological factors. We explored four factors: common mental health problems (depressive and anxiety symptoms), substance use (alcohol and tobacco use), personality traits (aggression and impulsivity), and previous suicide attempt. *Depressive and anxiety symptoms* were assessed using the 9-item Patient Health Questionnaire (PHQ-9) and the 7-item Generalized Anxiety Disorder (GAD-7) respectively [34, 35]. Participants rated the extent to which they experienced each symptom over the last two weeks as 0 (not at all), 1(several days), 2 (more than half the days) and 3 (nearly every day). Total scores for PHQ-9 and GAD-7 range from 0 to 27, and 0 to 21, respectively. *Alcohol use* was assessed using the clinical-administered version of the Alcohol Use Disorders Identification Test (AUDIT), a 10-item scale that explores drinking behaviours and alcohol-related problems over the last 12 months [36]. Each item was scored on a scale of 0 to 4, and the total score ranges from 0 to 40. For *Tobacco use,* participants were asked whether they had used any form of tobacco in the last 12 months (yes/no). Frequency of use was noted. Impulsivity was measured using the brief Barratt Impulsiveness Scale (BIS-Brief), a self-reported 8-item questionnaire looking at impulsivity as a unidimensional construct [37]. Participants rated statements that described their actions over the last 12 months, with responses ranging from 1 (rarely/

never) to 4 (almost always/always). *Aggression* was measured using the Buss-Perry Aggression Questionnaire, a 29-item inventory measuring various aggressive behaviours [38]. Participants rated how statements describing these behaviours applied to them over the last 12 months, on a scale ranging from 1 (extremely uncharacteristic of me) to 5 (extremely characteristic of me). For *previous suicide attempt*, participants were asked if they had ever made a suicide attempt (yes/no) (for cases, this was any *prior* to the current one). These instruments were chosen as they are widely regarded as the gold standards for the assessment of psychological factors, and have been extensively used in India [39–46]. We preferred symptom inventories over diagnostic measures, as they are easier to administer, especially by researchers who do not have wide-ranging clinical experience; involve the participants better; and yield scores (instead of dichotomous outputs) that can be used to increase statistical power. Chronbach's alpha for the scales were 0.867 (PHQ-9), 0.846 (GAD-7), 0.900 (AUDIT), 0.840 (Buss-Perry Aggression Questionnaire), and 0.648 (BIS-Brief).

Personal resources. Here, we explored socio-economic status (SES), coping style, and religiosity. The highest completed education level of the participant's mother was considered an indicator of *SES*. Maternal education has been a widely used proxy factor for SES in India, because of the fact that a majority of women are not in the formal workforce and do not receive a regular income, and because of its strong correlation with household resources, family wealth, and important health outcomes such as child nutrition [47–50]. Research indicates that mothers who are better educated tend to have better employment opportunities, higher income, greater awareness of health practices, better decision-making power and better access to health services - all of which are linked to SES [51, 52]. *Coping style* was assessed using the Brief-COPE scale, which explores 12 coping strategies, using 2 questions for each strategy [53]. Participants rated the extent to which they had coped a certain way in the last 12 months, on a scale from 1 to 4 ('I haven't been doing this at all' to 'I have been doing this a lot'). Separate scores for 'maladaptive' and 'adaptive' coping were obtained by adding the scores on the relevant subscales [54]. *Religiosity* was assessed by summing the scores for the questions on 'religious coping' from Brief-COPE. The scale was reliable and valid in India [54].

Digital behaviours. We included *gaming, internet use* and *social media* use over the last 3 months. Participants were asked much time they spent on these activities on a typical day (none/ < 30 minutes/30–60 minutes/etc).

Social factors. We included only those factors from the immediate social environment that could be assessed from participants' perspectives:

Negative life events (NLE). We asked participants whether they had experienced 19 adversities in the last year (yes/no) (Table 1.2). These NLE were chosen based on the PSLES scale, an inventory developed for Indian populations [55]; previous findings from India and China [56, 57]; suggestions by youth health experts in India; and pilot findings. We did not explore general physical health complaints in patients or their family members as risk factors since these were expected to be higher in controls. For each NLE scored 'positive' for a participant, we also collected descriptive data to understand the contextual manifestations of these NLE in the Indian context, through the form of detailed case narratives prepared by RAs We collected the following information on these NLE: 1. *WHAT the specific problems were*. Here, we included experiences of both 'events' (discrete occurrences of a specific phenomenon, which are identifiable and observable as something that takes place) as well as 'episodes' (ongoing or underlying difficulties, typically, a state of affairs). Some NLE were by definition only one or the either; for example, 'death' could only be an 'event' (not an episode) and so such details did not apply. For most NLE however ('education', 'work', 'relationships', 'finances', etc.) experiences could be events and/or episodes. 2. *WHEN they occurred*. For events, we collected information on the *last* time or *frequency* of occurrence, or whether experiences were *single* (one or more events took place on the same day) or *repeated* (occurred across days), and for episodes, we noted their *starting* and *ending* times. 3. *WHO was involved*. Where applicable (for example, in the case of 'death' or 'relationships'), we noted down any persons who were associated with the NLE.

Adverse events at lifetime. We explored if participants had ever experienced parental death, parents being divorced or separated, or coercion into marriage. The age at which they had experienced parental loss was also noted.

Social support. We assessed this in two ways. The first was perceived degree of social support over the last 12 months, which was measured by summing the scores on the emotional and instrumental support subscales of Brief-COPE. The second was social interaction over the last 12 months, where participants were asked how often in a month they spent time with persons other than those they lived with (not including school or work) (never/monthly or less/2–4 times a month/etc).

Suicidal behaviours in others. Participants were first asked if any *blood relative* had ever died by or attempted suicide. They were then asked the same questions about any *other* persons in their social environment (for example, other family or friends). We differentiated suicidal behaviours in blood relatives from those in others, as these are considered to have independent influences on

suicidal behaviour [58]. Who these persons were was noted.

Exposure to suicide-related information. We asked participants if they had ever sought or come across any information on suicide in the last month. Details as to what this information was and where it was accessed were also collected.

Data analysis

SPSS 29.0.20.0 was used to perform statistical analysis. Since this was a 1:1 matched study, *cox regression* models were employed, with the case or control being the 'status' variable and each case-control pair being the 'strata'. Since there is no time-to-event information, we set up a dummy "time" variable where all case and control participants were assigned a value of "1". Crude and adjusted odds ratios (OR) and their corresponding 95% confidence intervals (CI) were estimated. The primary analysis was based on the 151 cases and controls. Univariate analysis was first conducted to examine the association of each factor and suicide attempts. Total scores were used for continuous measures. Levels for categorical factors were based on frequency of responses or recommended guidelines. Significance was set at p value = 0.05. Multivariate analysis involved a *backward stepwise elimination* procedure with all factors that were statistically significant in the univariate analysis. We chose this procedure for two reasons: 1. *It treats all the factors as equal*. Since this is the first study of suicide attempts in young people in India to examine a range of factors (including some for which there was little prior information in the country), we avoid making any a-priori assumptions regarding the relative importance of these and thus, increase the objectivity of our findings. By ensuring that all variables are included at the outset, we also avoid unfair exclusions of important ones that may be significant only in the presence of others. 2. *It minimises overfitting*. Backward elimination systematically reduces the model to a more parsimonious one by re-evaluating factors at each step, leading to a better predictive performance and lower redundancy. Factors were added to the model if their p-value was below 0.05 and removed if their p-value exceeded 0.10. Multi-collinearity was assessed using the variance inflation factor (VIF). Although we did not find any obvious multicollinearity (VIF > 4) (Supplementary file 1), we decided to combine variables with VIF > 2 if they were strongly correlated, in order to prevent them from 'cancelling each other out'. Thus, we combined PHQ-9 and GAD-7 (Pearson's correlation = 0.80), and internet and social media use (Cramer's V = 0.73). We also chose to combine 'relationship problems with partners', 'relationship problems with family', and 'parental conflict' to represent the overall impact of interpersonal issues involving significant persons on suicide attempts; and to simplify our model for interpretation, improve model stability and maximise statistical power. Additionally, we retained scores of continuous measures rather than converting those to categorical as far as was possible, converted all categorial factors to 2 levels, and removed factors with less than 10 observations for the least frequent level for that factor. To simplify interpretations of ORs in the model, we used the 'higher' level of a protective factor as the reference category. The omnibus test of model coefficients was used to assess the goodness of-fit. There were only a few missing values in the analysis, mostly due to some participants (mainly cases) who did not complete their interviews ($N = 5$), did not know the answer regarding maternal education ($N = 10$) or refused to answer specific questions (with potentially 'socially undesirable' responses, for example, regarding coping style or aggression) ($N = 7$); we retained these as they were, opting for a complete case analysis rather than imputing values because of the potential for the latter to introduce bias and artificially reduce the natural variability of data. We ran a sensitivity analysis without SES, since the data was overall skewed towards low SES, and potentially confounded with other variables. Since cases and controls were matched for age and gender, we did not control for these variables as covariates. However, we added gender as an interaction term to the final model, and also conducted an exploratory subgroup analysis by repeating the above steps separately for males and females. Because the study was not powered for this analysis, we used a more parsimonious multivariate model by only including those significant variables from the univariate analysis that were the most robust correlates of suicidal behaviour from recent literature [59, 60], and relaxed our p values (entry = 0.10, exit = 0.15).

To understand the contextual nature of the NLE that emerged as significant, we analysed the narrative data from the cases group. To identify 'WHAT', we employed *content analysis* [61]. Narratives prepared by RAs were coded independently by two persons (MB, SP-YCMH), using a template derived from qualitative interviews conducted with cases in the first 3 months of the study (further details are available in [62]). Any discrepancies in coding were resolved through discussion. Inter-rater agreement using percentage agreement methods was 76%. To derive exact dates regarding the 'WHEN' of each event or episode, we used a set of pre-defined "rules" (The NLE protocol is available on request). For 'WHO' was involved, we categorised the responses given by participants. Descriptive statistics were used to analyse and present our data. This analysis was conducted using MS Office packages (Microsoft 2021 MSO, Version 2509).

The reporting of this study is in accordance with the STROBE guidelines [63].

The study was approved by the IRB of Sangath, the organisation conducting the study (registration: MB_2017_28; date: 19.08.2017).

Results

Sample characteristics

Figure 1 shows the enrollment of participants over the study period. The response rates for cases and controls were 65.9% and 24.3% (respectively). In the cases group, there were more males amongst the participants ($N = 151$) than those who were eligible but did not participate ($N = 78$) (Chisq = 4.746, $p = 0.029$). Among the Controls, participants ($N = 151$) were younger than eligible persons who did not participate ($N = 471$) ($t = -2.959$, $p = 0.003$). The final sample comprised of 302 individuals, 151 Cases and 151 Controls. There were slightly more males than females (53.6%; 81 pairs). The mean (sd) ages of the cases and controls were 21.89 (4.043) years and 21.75 (3.681) years ($p = 0.391$). Among the cases, ingestion of pesticides was the most commonly used suicide method ($N = 91$, 60.3%), followed by ingestion of household disinfectants ($N = 33$, 21.9%), ingestion of medication ($N = 17$, 11.3%), hanging ($N = 7$, 4.6%), and 'other' methods ($N = 3$, 2%). 80 (53%) had attempted suicide at home. The median time from the hospital visit to interview was 2 days for the cases (range: 1–18) and the day of the hospital visit for the controls (range: 0–14). The median interview time for cases was 101 minutes (range: 47–174), and for controls, 66 minutes (range:37–120).

Univariate analysis

Tables 1.1 and 1.2 show the results of the univariate analysis. Descriptive details regarding the factors are presented in *italics*. We identified several *individual-level* factors that differentiated cases and controls. Compared to controls, cases were less likely to be students, and more likely to be ever-married. All psychological factors assessed were more prevalent in cases: they had higher depression, anxiety, alcohol use, impulsiveness and aggression scores; and were more likely to have used tobacco over the last 12 months or to have made a previous suicide attempt. Cases were also more likely to have low SES and higher maladaptive coping scores. More controls than cases had higher internet and social media use. Many of the *social* factors also differed between the groups. Cases had a higher frequency of most NLE; however, the only ones that were significantly related to suicide attempts were relationships involving partners or family. Cases were also more likely to have lost a parent than controls. More controls than cases had frequent social interactions. Controls were more likely to know a person in their social environment (other than a blood relative) who had suicidal behaviour and were also more likely to be exposed to suicide-related information in the last month. In the males subgroup (Supplementary file 2) cases were more likely to be Hindus, have lower adaptive coping and religiosity scores, and experience a break-up. Among the females (Supplementary file 2), more cases had parents who were separated or divorced.

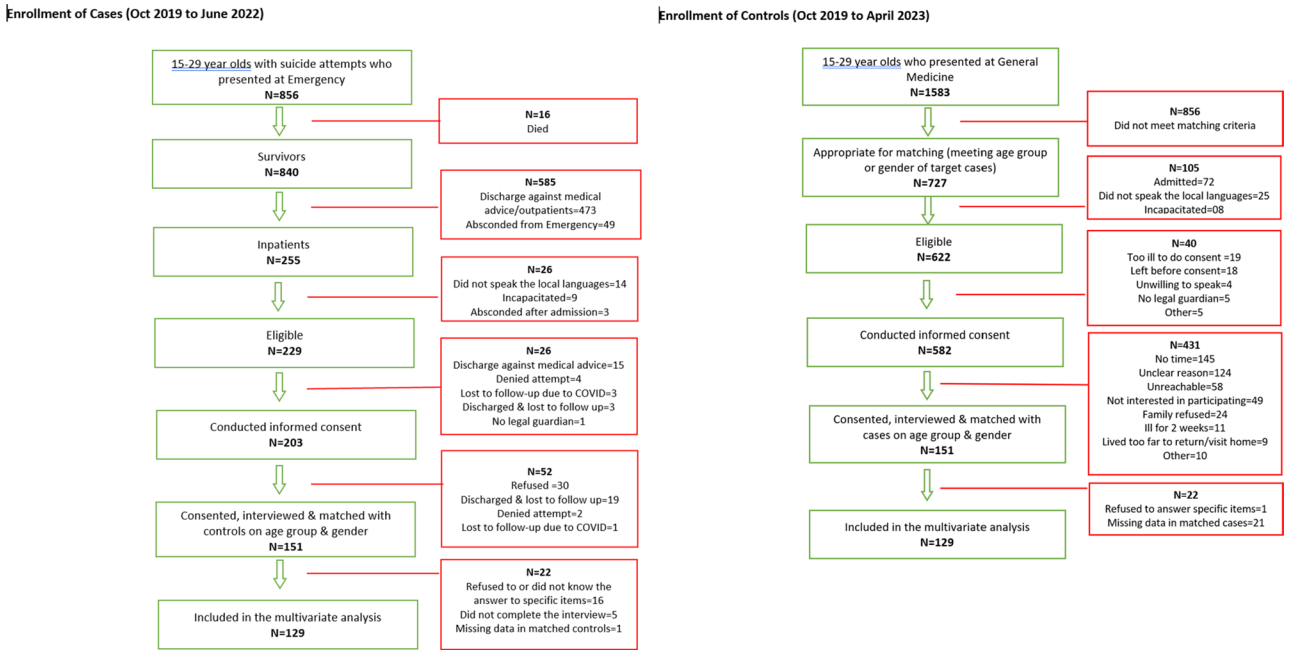

Fig. 1 Enrolment of participants during the study period

Table 1.1 Results of the univariate analysis - unadjusted association between individual-level factors and suicide attempts

Factor	Cases N = 151 (50%)	Controls N = 151 (50%)	OR	95% CI	*P* value
Demographics					
Employment status last 1 month	151 (100.0%)	151 (100.0%)			
Student (ref)	30 (19.9%)	62 (41.1%)			<0.001*
Not employed	34 (22.5%)	25 (16.6%)	3.736	1.662–8.401	0.001*
Employed	87 (57.6%)	64 (42.4%)	3.642	1.876–7.068	<0.001*
Religion currently practiced	151 (100.0%)	151 (100.0%)			
Hinduism (ref)	108 (71.5%)	119 (78.8%)			
Other	43 (28.5%)	32 (21.2%)	1.550	0.883–2.719	0.127
Marital status	151 (100.0%)	151 (100.0%)			
Never married (ref)	87 (57.6%)	113 (74.8%)			
Ever married	64 (42.4%)	38 (25.2%)	4.714	2.085–10.657	<0.001*
Psychological factors					
Common Mental Health problems					
Depressive symptoms last 2 weeks (PHQ-9 mean score)^^^	148 (98.0%) Mean=7.80	151 (100.0%) Mean=5.12	1.068	1.027–1.112	0.001*
Anxiety symptoms last 2 weeks (GAD-7 mean score)^^^	148 (98.0%) Mean = 5.23	151 (100.0%) Mean = 3.31	1.081	1.029–1.137	0.002*
Substance use					
Tobacco use in the last 12 months	147 (97.4%)	151 (100.0%)			
No (ref)	86 (58.5%)	130 (86.1%)			
Yes	61 (41.5%)	21 (13.9%)	6.714	3.035–14.854	<0.001*
If yes, frequency of use:					
Monthly or more	13 (21.3%)	11 (52.4%)			
Daily or almost daily	48 (78.7%)	10 (47.6%)			
Alcohol use over the last 12 months (AUDIT mean score)	147 (97.4%) Mean=4.93	151 (100.0%) Mean=0.86	1.375	1.173–1.611	<0.001*
Personality					
Aggression over the last 12 months (Buss-Perry mean score)	141 (93.4%) Mean=77.54	150 (99.3%) Mean=71.79	1.016	1.003–1.028	0.016*
Impulsivity over the last 12 months (BIS-8 mean score)	145 (96.0%) Mean=16.62	150 (99.3%) Mean=15.16	1.077	1.022–1.136	0.006*
Previous suicide attempt	151 (100.0%)	151 (100.0%))			
No (ref)	111 (73.5%)	141 (93.4%)			
Yes	40 (26.5%)	10 (06.6%)	4.750	2.216–10.181	<0.001*
Personal resources					
SES – highest completed mother's education	141 (93.4%)	151 (100.0%)			
Primary or below (ref)	118 (83.7%)	93 (61.6%)			<0.001*
Middle school	18 (12.8%)	44 (29.1%)	0.318	0.166–0.608	<0.001*
High school and above	05 (03.5%)	14 (09.3%)	0.257	0.080–0.830	0.023*
Maladaptive coping style last 12 months	147 (97.4%)	150 (99.3%)			
Mean score on maladaptive coping subscales of COPE	Mean=26.67	Mean=23.99	1.106	1.051–1.163	<0.001*
Adaptive coping style last 12 months	147 (97.4%)	150 (99.3%)			
Mean score on adaptive coping subscales of COPE	Mean=42.69	Mean=43.87	0.978	0.946–1.010	0.179
Religiousity last 12 months	149 (98.7%)	151 (100.0%)			
Mean score on religious coping subscales of COPE	Mean=4.40	Mean=4.80	0.913	0.822–1.014	0.090
Digital behaviours					
Gaming on a typical day	146 (96.7%)	151 (100.0%)			
No gaming (ref)	55 (37.7%)	66 (43.7%)			0.258
<=1 hour	56 (38.4%)	61 (40.4%)	1.083	0.613–1.914	0.784
>1 hour	35 (24.0%)	24 (15.9%)	1.707	0.887–3.285	0.110
Social media use on a typical day^^	146 (96.7%)	151 (100.0%)			
<-1 hr (ref)	40 (27.4%)	25 (16.6%)			0.083
1-3 hours	55 (37.7%)	67 (44.4%)	0.504	0.267–0.949	0.034*
>3 hours	51 (34.9%)	59 (39.1%)	0.529	0.276–1.012	0.054

Table 1.1 (continued)

Factor	Cases N = 151 (50%)	Controls N = 151 (50%)	OR	95% CI	*P* value
Internet use on a typical day^^	146 (96.7%)	151 (100.0%)			
<-1 hr (ref)	31 (21.2%)	12 (07.9%)			0.005*
1-3 hours	48 (32.9%)	51 (33.8%)	0.253	0.098–0.654	0.005*
>3 hours	67 (45.9%)	88 (58.3%)	0.219	0.088–0.544	0.001*

KEY

*p value < 0.05

(ref) – reference category

^^Merged for multivariate analysis based on use of > 1 hour on either scale

^^^Merged for multivariate analysis based on cut off score of 10 on either scale

Information presented in italics are additional data and were not used in the multivariate analysis

Multivariate analysis

Table 2 shows the results of the multivariate analysis. There were eight factors that were independently associated with suicide attempts. At the *individual-level*, clinically significant depressive or anxiety symptoms over the last two weeks, previous suicide attempt, alcohol use, impulsivity and low SES were significant. There was a significant interaction effect for gender and alcohol use (Waldz = 5.80, $p = 0.016$); alcohol use was a risk factor only for males (Supplementary files 2, 3). Among the *social* factors, lack of exposure to suicide-related information in the last month, lack of social interactions over the last 12 months, and the presence of interpersonal NLE involving partners or family in the last 12 months were significant. In our sensitivity analysis (Supplementary file 4), being ever-married and not knowing a person in the social environment with suicidal behaviour were also significant. The omnibus test of model coefficients showed a good fit of the final as well as the modified regression model (−2 loglikelihood = 53.435, $p = < 0.001$ and −2 loglikelihood = 56.021, $p = < 0.001$ respectively). In the males subgroup (Supplementary file 3), not being a student was also significant.

Descriptive analysis of NLE

Our descriptive analysis of the interpersonal NLE (Table 3, Supplementary files 5–8) revealed the following:

WHAT: Cases experienced a variety of problems in their relationships (Table 3, Supplementary file 5). Of the ones who experienced problems with partners and family (56% and 60% respectively), the most frequently observed event was 'conflict' and the most frequently observed episode was 'unmet needs or conflicting expectations', reported by over 50%. Among problems with partners, experiences of 'suspicions', 'threat to the relationship' and 'violence' were also common, reported by 30% or more cases. Among problems with family, 'violence' and 'bullying' were common, experienced by over 25% of cases. Experiences of 'unpleasant discoveries', 'family interference', 'jealous partner', 'estrangement', 'restricted freedom by family', 'distrust' were also present, though less common (experienced by 10–20%). A minority of persons (< 10%) reported other problems such as 'addiction' of partner or family, 'infidelity of partner', 'restricted freedom by partner', 'avoidance' by partner or family, 'betrayal' by family, 'sexual harassment' by family, 'disputes over property', and having a 'troublesome child'. Cases typically had two events over the last 12 months, and at least one major episode. Of the cases who experienced parental conflict (23%), 53% reported 'addiction' of the father as the reason. Less frequently observed problems included 'unmet needs or conflicting expectations in the relationship', 'quarrels over finances', 'violence by father', and 'parenting differences'.

WHEN: Of those who experienced problems with partners or family, approximately 80% experienced an event within the last month and 50% experienced an event in the last 48 hours (Table 3, Supplementary file 6). The median time from a partner or family event to the attempt was 1 (the day before) and 0 (the day of the attempt) respectively. These events were most typically 'conflict' and 'violence' (Supplementary file 7). Most persons (over 80%) had 'repeated' events (Table 3). Some events like 'bullying' and 'unpleasant discoveries' tended to be 'single' or rare events; others like 'conflict' and 'suspicions' were more frequent, occurring at least once a month (Supplementary file 8). The average duration of episodes with partners or family was 3 years; for parental conflict, this was 10 years (Table 3).

WHO: Partners included both significant others and spouses (Table 3). Only 3 persons had problems with both (i.e., they were in another relationship while being married, and had problems with both persons). Family members were most typically parents (in 65% of cases); others included siblings, family by marriage or others (extended family such as uncles or cousins).

Discussion

This study considered individual-level and social characteristics of 151 young people with suicide attempts, matched with 151 controls, from a hospital in a city in India. With the exception of the male:female distribution

(which reflect the near equal suicide rates among young males and females in India), our sample is broadly representative of suicide attempts that occur in other urban settings [64, 65]. Suicide methods reported are similar to those observed in India and in other Asian countries where the ingestion of pesticide is also common [66]; however, they differ from countries such as the USA or the UK where firearms or drug use are more prevalent [67]. Overall, our findings imply that cases were more socially disadvantaged than controls - being in poorer economic positions, having fewer social contacts with persons outside the family, and facing more damaging negative interactions with persons in their core supportive networks such as partners and family.

As expected, NLEs were positively associated with suicide attempts. We observed a wide range of problems, which included both frequent events and long-term difficulties. Our findings highlight the importance of issues such as 'conflict' and 'violence' in relationships; these problems have also been observed in other studies in India [24, 68] and are consistent with reports on suicidal behaviours in young people from other countries [69, 70]. Our study adds to the literature on the role of interpersonal difficulties in suicide attempts by uncovering new problems such as 'unpleasant discoveries', and drawing attention to concerns relevant to the Indian socio-cultural context, for example, 'unmet needs', 'restricted freedom', 'family interference', 'jealous partner', and 'addictions'. These findings reflect characteristics of many Indian households and families, where patriarchy, control, and the placing of the family unit over the interests of the individual lead to abusive and intolerable environments, intergenerational tensions and conflict [62, 71, 72]. Over 50% of cases experienced an event in the last 48 hours, which highlights the importance of acute crisis dynamics, and is consistent with reports from other studies, particularly from China [73, 74]. Like data from several other countries, we noted that clinically significant mood symptoms, previous suicide attempt, impulsivity and low SES were also important [69, 70, 75–81].

However, there were some differences between the results of our study and that of others. *First,* we did not find interpersonal problems with persons *other than* partners or family (for example, peers) to be significant. This can be explained by the pivotal role played by family in the lives of young Indians, with spouses or parents being the primary units of socialisation and the principal sources of support, with these relationships often taking precedence over other social ties [82]. It may also reflect our sample characteristics. A majority of participants were of low SES; our earlier qualitative study involving some of the cases [62] revealed that the family environments of these individuals are more inward-looking, with harsher parenting and restrictive gender norms that may have limited opportunities for meaningful engagement with persons outside. Our previous research also indicates that interpersonal adversities in India may exert a more powerful influence than other stressors, as they tend to be deep rooted in socio-cultural beliefs and practices and are more proximal than others, producing high levels of emotional distress [62]. *Second,* cases were substantially *less* likely to be exposed to suicide-related information than controls. This may reflect measurement characteristics. Our question to participants was, *"In the last one month, did you try to find any information on suicide? What about coming across such information?";* as we did not make any qualifications regarding 'information' and left it to interpretation, we may have missed out on eliciting exposures more specific to, or containing more harmful material on suicide. A majority of our participants reported seeking or coming across news reports of suicide cases rather than suicide-specific details such as suicide methods or lethal doses (Table 1.2); thus, 'exposure' being higher in controls may reflect their greater access to or awareness of this sort of information which tends to be more neutral (perhaps even positive) than harmful. Possibly they were more well-read or watched more television (Table 1.2). This finding may also reflect the potentially close associations between such exposures and being a student, the use of the internet or social media, and/or SES – all of which were more frequently observed in controls. The relationship between exposure to suicide-related information and suicide attempts needs further exploration, with studies investigating both harmful and beneficial influences of specific types of information on suicide. *Third,* suicidal behaviour in blood relatives was not a significant factor. This may also be explained by our interview question, which did not differentiate first-degree from other blood relatives (also see Table 1.2). *Fourth*, we did not find higher use of internet or social media use to be relevant, despite the growing body of evidence regarding its negative impact on young people. In fact, these behaviours were higher among controls. Since a vast proportion of persons in India tend to access the Internet and social media on smartphones [83], it is likely that this finding is a reflection of more controls owning or having greater access to such devices, as they typically came from higher SES and were more likely to be students. We did not find this trend for gaming however, and this is likely to be due to the fact that gaming does not always involve the internet, is often not social, and does not necessarily require a smartphone (i.e., they can be played on basic phones or other devices, or in gaming centres).

In our sensitivity analysis which excluded SES, two other factors were significant. First, controls were more likely to have known a person in their social environment with suicidal behaviour. This is likely a proxy factor for a

Table 1.2 Results of the univariate analysis - Unadjusted association between social factors and suicide attempts

Factor	Cases N = 151 (50%)	Controls N = 151 (50%)	OR	95% CI	P value
NLE in the last 12 months					
Loss of loved ones	151 (100.0%)	151 (100.0%)			
No (ref)	113 (74.8%)	109 (72.2%)			
Yes	38 (25.2%)	42 (27.8%)	0.875	0.527–1.453	0.606
Disappointments or episodes reg. education#	70 (46.4%)	98 (64.9%)			
No (ref)	44 (62.9%)	58 (59.2%)			
Yes	26 (37.1%)	40 (40.8%)	0.556	0.256–1.203	0.136
Disappointments or episodes reg. work##	119 (78.8%)	98 (64.9%)			
No (ref)	53 (44.5%)	37 (37.8%)			
Yes	66 (55.5%)	61 (62.2%)	0.667	0.367–1.210	0.183
Relationship problems with partners%	150 (99.3%)	151 (100.0%)			
No (ref)	66 (44.0%)	109 (72.2%)			
Yes	84 (56.0%)	42 (27.8%)	3.471	2.023–5.953	< 0.001*
Ending of a romantic relationship	150 (99.3%)	151 (100.0%)			
No (ref)	126 (84%)	136 (90.1%)			
Yes	24 (16%)	15 (09.9%)	1.643	0.845–3.193	0.143
Divorce or separation from spouse &	64 (42.4%)	38 (25.2%)			
No (ref)	40 (62.5%)	34 (89.5%)			
Yes	24 (37.5%)	04 (10.5%)	2.000	0.602–6.642	0.258
Living apart from child (!)@	38 (25.0%)	22 (13.9%)			
No (ref)	33 (86.8%)	21 (100.%)			
Yes	05 (13.2%)	00 (00.0%)	-	-	-
Relationship problems with family members%	150 (99.3%)	151 (100.0%)			
No (ref)	60 (40.0%)	87 (57.6%)			
Yes	90 (60.0%)	64 (42.4%)	2.174	1.327–3.562	0.002*
Relationship problems with others (friends, neighbours, etc)	150 (99.3%)	151 (100.0%)			
No (ref)	108 (72.0%)	106 (70.2%)			
Yes	42 (28.0%)	45 (29.8%)	0.906	0.548–1.498	0.701
Parental conflict%	150 (99.3%)	151 (100.0%)			
No (ref)	118 (78.7%)	133 (88.1%)			
Yes	32 (21.3%)	18 (11.9%)	1.933	1.037 –3.606	0.038*
Financial disappointments or episodes	150 (99.3%)	151 (100.0%)			
No (ref)	52 (34.7%)	48 (31.8%)			
Yes	98 (65.3%)	103 (68.2%)	0.862	0.505–1.472	0.587
Sexual difficulties	150 (99.3%)	150 (99.3%)			
No (ref)	141 (94.0%)	143 (95.3%)			
Yes	09 (06.0%)	07 (04.7%)	1.286	0.479–3.452	0.618
Unwanted pregnancy^	28 (18.5%)	20 (13.2%)			
No (ref)	20 (71.4%)	16 (80.0%)			
Yes	08 (28.6%)	00 (20.0%)	1.000	0.202–4.955	1.000
Miscarriage(!)^	28 (18.5%)	20 (13.2%)			
No (ref)	26 (92.9%)	19 (95.0%)			
Yes	02 (07.1%)	01 (05.0%)	-	-	-
Infertility&	64 (42.4%)	38 (25.2%)			
No (ref)	56 (87.5%)	36 (94.7%)			
Yes	08 (12.5%)	02 (05.3%)	6.000	0.722–49.837	0.097
Problematic drinking in a family member	150 (99.3%)	151 (100.0%)			
No (ref)	105 (70.0%)	117 (77.5%)			
Yes	45 (30.0%)	34 (22.5%)	1.458	0.867–2.452	0.155
Legal disappointments or episodes	150 (99.3%)	151 (100.0%)			
No (ref)	119 (79.3%)	121 (80.1%)			
Yes	31 (20.7%)	30 (19.9%)	1.040	0.601–1.801	0.889

Table 1.2 (continued)

Factor	Cases N = 151 (50%)	Controls N = 151 (50%)	OR	95% CI	P value
Witnessing a potentially traumatic event	150 (99.3%)	151 (100.0%)			
No (ref)	123 (82.0%)	119 (78.8%)			
Yes	27 (18.7%)	32 (21.2%)	0.783	0.422–1.450	0.436
Any other NLE not covered above	150 (99.3%)	151 (100.0%)			
No (ref)	140 (93.3%)	133 (88.1%)			
Yes	10 (06.7%)	18 (11.9%)	0.467	0.190–1.145	0.096
Adverse events at lifetime					
Parental death	151 (100.0%)	151 (100.0%)			
No (ref)	114 (75.5%)	129 (85.4%)			
Yes	37 (24.5%)	22 (14.6%)	2.071	1.095–3.920	0.025*
If yes, when the death occurred,					
After 8 years	23 (62.2%)	13 (59.1%)			
<8 years	14 (37.8%)	09 (40.9%)			
Parents divorced or separated	147 (97.4%)	149 (98.7%)			
No (ref)	134 (91.2%)	144 (96.6%)			
Yes	13 (08.8%)	05 (03.4%)	2.600	0.927–7.293	0.069
Coerced into marriage	64 (42.4%)	38 (25.2%)			
No (ref)	50 (78.1%)	32 (84.2%)			
Yes	14 (21.9%)	06 (15.8%)	1.200	0.366–3.932	0.763
Social support					
Perceived degree of social support	148 (98.0%)	150 (99.3%)			
Mean score on emotional & instrumental support subscales of COPE	Mean=11.82	Mean=11.63	1.016	0.952–1.086	0.627
Social interactions over the last 12 months	146 (96.7%)	151 (100.0%)			
No interactions (ref)	26 (17.8%)	05 (03.3%)			0.002*
Monthly or less	39 (26.7%)	58 (38.4%)	0.163	0.059–0.455	<0.001*
Weekly or more	81 (55.5%)	88 (58.3%)	0.214	0.080–0.572	0.002*
Suicidal behaviours in others					
Suicide or attempt in blood relatives at lifetime	151 (100.0%)	151 (100.0%)			
No (ref)	104 (68.9%)	107 (70.9%)	1.103	0.668–1.824	0.701
Yes	47 (31.1%)	44 (29.1%)			
If yes, What relative$					
First-degree relative (parent, sibling)	28 (59.6%)	06 (13.6%)			
Other (grandparent, cousin, aunt, uncle, etc)	23 (48.9%)	40 (90.9%)			
Suicide or attempt in others in the environment at lifetime	151 (100.0%)	151 (100.0%)	0.447	0.267–0.747	0.002*
No (ref)	66 (43.7%)	40 (26.5%)			
Yes	85 (56.3%)	111 (73.5%)			
If yes, What persons$					
Family by marriage (in-laws, brothers or sisters in law, etc)	16 (18.8%)	09 (08.1%)			
Friends	46 (54.1%)	44 (39.6%)			
Neighbours	32 (37.6%)	44 (39.6%)			
Others (colleagues, classmates, teachers, friends/families of friends etc)	15 (17.6%)	43 (38.7%)			
Exposure to suicide-related information					
Sought or came across information on suicide last 1 month	151 (100.0%)	151 (100.0%)	0.200	0.108–0.372	<0.001*
No (ref)	123 (81.5%)	75 (49.7%)			
Yes	28 (18.5%)	76 (50.3%)			
If yes, What information$					
Reports of suicide cases in the general public	19 (67.9%)	71 (93.4%)			
Specific information on suicide – where to obtain substances, how to attempt suicide, why persons live or die etc	11 (39.3%)	08 (10.5%)			
If yes, Source of information$					
Newspapers or media reports	04 (14.3%)	18 (23.7%)			
Social media sites or Internet	11 (39.3%)	23 (30.3%)			

Table 1.2 (continued)

Factor	Cases N = 151 (50%)	Controls N = 151 (50%)	OR	95% CI	P value
Conversations with others	15 (53.6%)	31 (40.8%)			
TV	01 (03.6%)	23 (30.3%)			
Books	00 (00.0%)	01 (01.3%)			

KEY

*p value < 0.05

(ref) – reference category

(!)excluded from analysis because of insufficient sample size

% Merged for multivariate analysis as presence of one or more problems

$A person can be coded for more than one category, so the % will not add up to 100

#These questions were only asked for those interested in/already pursuing education

These questions were only asked for those interested in/already working

&These questions were asked only for ever married

@These questions were asked only for those with children

^ These questions were asked only for women who have ever been pregnant

Table 2 Results of the multivariate analysis* - adjusted association between factors and suicide attempts

Factor	Adjusted OR (95% CI)	P value
Clinically significant depressive or anxiety symptoms over the last 2 weeks	3.853 (1.204–12.333)	0.023
Alcohol use over the last 12 months (AUDIT mean score)#	2.002 (1.350–2.968)	< 0.001
Impulsivity (BIS-8 mean score)#	1.184 (1.048–1.339)	0.007
Previous suicide attempt	3.947 (0.948–16.433)	0.059
Low SES (mother's education primary or below)	3.524 (1.064–11.667)	0.039
Interpersonal problems involving partner or family last 12 months	4.827 (1.317–17.689)	0.018
Lack of social interactions over the last 12 months	13.986 (1.813–107.895)	0.011
Lack of exposure to suicide-related information in the last 1 month	26.257 (5.441–126.704)	< 0.001

*Included 129 pairs. Potential factors not considered in this model include gender and age (since this was a matched study). All other factors that were significant in the univariate analysis (Tables 1.1 and 1.2) were considered in this model. The analysis was conducted using backward stepwise methods

#With every unit increase in AUDIT, the odds of being a case approximately doubled. With every unit increasein BIS-8, the odds of being a case was 18.4% times higher

stronger social network and social connectedness, which are widely recognised protective factors against suicide [84], and is consistent with more controls being in education and having higher socialisation (Tables 1.1 and 1.2). Second, cases were more likely to be ever-married. The social characteristics of marriage in India (early, arranged or forced marriages; dowry disputes; patriarchal or joint family structures, etc) may pose increased risks for young people [85, 86]. It is possible that these factors were previously absent in the model due to their relationship to maternal education and/or because of lower power (as removing SES added 10 pairs to the analysis).

We found alcohol use to be a risk factor, but only for males. Evidence from suicide literature remains mixed with regards to gender, with a majority of studies reporting alcohol use as a risk factor in both groups [87, 88], and some even reporting a higher risk of suicide in female drinkers [89, 90]. Alcohol consumption among females in Maharashtra varies greatly, with trends showing increasing use by women in urban areas, though the overall prevalence is lower than that in men. In our sample, less than 1% of females used alcohol in the last year (as reflected in their very low mean AUDIT score) and this may account for the absence of alcohol-related attempts in this group. Future research needs to examine the association between alcohol use and gender in different settings in India. In our subgroup analysis, we also found that male cases were less likely to be in education. School or college environments may offer opportunities for experiencing social connectedness and support, and for greater awareness of or access to information on suicide [91]. We also observed that while both males and females were affected by interpersonal problems, the nature of some of the problems differed, with males more affected by the ending of romantic relationships, and females, by parental conflict. Unfortunately, we were unable to include some factors that were significant in the univariate analysis in our gender-specific models, for example, religion (for males), or parental divorce at lifetime (for females); the role of these variables needs to be explored further in future studies. Overall, our subgroup analysis was only an exploratory one and thus, the findings are preliminary and need to be investigated further before any conclusions can be made regarding gender-specific correlates of suicide attempts in young people in India.

Our results are comparable with the constructs in the The integrated motivational–volitional (IMV) model, which illustrates the complex interplay of factors in

Table 3 Interpersonal NLE involving partners or family – the WHAT, WHEN and WHO

Type of NLE	N (%)
1. Relationship problems with partners*	84 (56.0%)
WHAT WERE THE PROBLEMS?$	84 (56.0%)
Events	
Conflict	66 (78.6%)
Suspicions, discoveries and/or accusations of infidelity in the relationship	31 (36.9%)
Threat to the relationship	27 (32.1%)
Violence by partner	25 (29.8%)
Unpleasant discoveries	10 (11.9%)
Bullying by partner	07 (08.3%)
Rejection	01 (01.2%)
Thwarted elopement	01 (01.2%)
Median number of events (range)	2 (0-4)
Episodes	
Unmet needs or conflicting expectations in the relationship	62 (73.8%)
Family interference	16 (19.0%)
Jealous partner	14 (16.7%)
Addiction of partner	08 (09.5%)
Infidelity of partner	07 (08.3%)
Restricted freedom by partner	06 (07.1%)
Avoidance by partner	04 (04.8%)
Median number of episodes (range)	1 (0-5)
WHEN DID THEY OCCUR?	
For events,	
Days since last event	82 (66.7%)
Over 31 days	15 (18.3%)
30 days or lesser	23 (28.0%)
Last 48 hours	44 (53.7%)
Mean days since last event	29.49 days
Mean days since last event	1 (day prior)
Single or repeated event	82 (66.7%)
Single (one or more events on a given day)	10 (12.2%)
Repeated (events repeat over time)	72 (87.8%)
For episodes,	69 (67.6%)
Mean duration of episodes (in days)	919
WHO DID THEY INVOLVE?$	84 (56.0%)
Spouse	44 (52.4%)
Significant other	37 (44.0%)
Both	03 (03.6%)
2. NLE relationship problems with family*	90 (60.0%)
WHAT WERE THE PROBLEMS? $	90 (60.0%)
Events	
Conflict	76 (84.4%)
Violence by family	32 (35.6%)
Bullying by family	24 (26.7%)
Unpleasant discoveries	14 (15.6%)
Betrayal	01 (01.1%)
Sexual harassment	01 (01.1%)
Median number of events	2 (0-5)
Episodes	
Unmet needs or conflicting expectations in the relationship	57 (63.3%)
Estrangement	18 (20.0%)
Restricted freedom by family	14 (15.6%)
Distrust	11 (12.2%)

Table 3 (continued)

Type of NLE	N (%)
Addiction of family	07 (07.8%)
Avoidance by family	05 (05.6%)
Disputes over property	03 (03.3%)
Troublesome child	01 (01.1%)
Unspecified issue	01 (01.1%)
Median number of episodes	1 (0-4)
WHEN DID THEY OCCUR?	
For events,	
Days since last event	84 (60.4%)
Over 31 days	16 (19.0%)
30 days or lesser	16 (19.0%)
Last 48 hours	52 (61.9%)
Mean days since last event	29.2
Median days since last event	0 (same day)
Single or repeated event	85 (59.9%)
Single (one or more events on a given day)	16 (18.8%)
Repeated (events repeat over time)	69 (81.2%)
For episodes,	74 (56.9%)
Mean duration of episodes (in days)	1153
WHO WAS INVOLVED?$	90 (60.0%)
Parent	59 (65.6%)
Sibling	25 (27.8%)
In-laws or other family by marriage	26 (28.9%)
Other (aunts, uncles, cousins, grandparents, etc)	21 (23.3%)
3. Parental conflict*&	32 (21.3%)
WHAT WERE THE PROBLEMS?$	32 (21.3%)
Addictions of the father	17 (53.1%)
Unmet needs or conflicting expectations in the relationship	09 (28.1%)
Quarrels over finances	09 (28.1%)
Violence by father	06 (18.8%)
Parenting differences	03 (09.4%)
Other	03 (09.4%)
WHEN DID THEY OCCUR?	32 (21.3%)
Mean duration of episodes (in days)	3911

&This was conceptualised as an episode and hence there is no 'last time' or 'frequency'

$A narrative/participant can be coded for more than code, so the proportions will not add up to 100

suicidal behaviours [92]. Interpersonal NLE, alcohol use, depressive and anxiety symptoms, and SES are likely to be important "background factors", with acute interpersonal events constituting triggers. Poor socialisation may contribute to "ideation formation", and impulsivity, acute alcohol use, and previous suicide attempt may lead to "behaviour enaction". Our earlier qualitative study also supports this comparison [62]. Overall, our findings lend strong support for employing a multifactorial approach to the prevention of suicide in young people in India. The main components of India's National Suicide Prevention Strategy [93]—reinforcing leadership, building capacity of health systems, developing community resilience and increasing suicide surveillance—provide an appropriate platform for launching prevention programs specifically targeted at young people. We recommend that these programs concentrate on educating the public about suicide and mental health; fostering life skills in young people related to improving resilience to stressors, reducing impulsivity, resolving interpersonal conflict, and improving mental health; training gatekeepers to identify and treat high-risk individuals; controlling access to pesticides and alcohol; developing alternative community networks to provide support to people experiencing family crises; engaging with vulnerable families to improve conflict-resolution skills and enhance support; and implementing social, economic and legal reforms to strengthen family structures, improve financial conditions and reduce violence. Specific strategies to address each identified factor are elaborated in Table 4.

Table 4 Factor-specific recommendations for suicide prevention

Factor	Recommended strategies for suicide prevention
Clinically significant depressive or anxiety symptoms	Conducting wide-spread psychoeducation programs to improve knowledge about mental health Fostering life skills in young people related to managing depression and anxiety, coping, and problem-solving Scaling up evidence-based interventions for anxiety and depression Strengthening capacity of health workers and systems to identify problems and provide mental health care Training gatekeepers such as teachers and families to recognise and refer individuals in need of support
Alcohol use	Conducting wide-spread psychoeducation programs to promote safe use of alcohol Restricting the availability of alcohol through increased taxes or regulated sales Setting up de-addiction centres and support services for those with alcohol-related problems
Impulsivity	Fostering life skills in young people related to managing impulsivity and emotional dysregulation Restricting access to means such as pesticides
Previous suicide attempt	Establishing mechanisms for reliable and accurate reporting of suicide attempts Training gatekeepers to identify high-risk individuals Training health professionals to assess risk for suicide, implement crisis interventions, and provide evidence-based therapies for individuals Scaling up suicide-helplines
Low SES (mother's education)	Implementing economic reforms to reduce financial strain and improve monetary conditions of young people and their families Improving literacy of and providing employment opportunities for women Improving access to resources like informational materials and counselling for women
Lack of exposure to suicide-related information	Promoting accurate and helpful information about suicide through the Internet and social media platforms Ensuring responsible and safe media coverage of suicides in the general public
Lack of social interactions	Fostering social skills in young people related to building relationships outside the family Creating and encouraging participation in peer groups in housing communities, educational institutions and neighbourhoods Establishing and encouraging participation in non-academic social clubs or activity centres for young people
Interpersonal problems involving partners or family	Implementing evidence-based conflict resolution and communication skills training programs for young couples and families Implementing specific strategies for key interpersonal issues such as 'violence' or 'control', such as empowering women, challenging gender stereotypes, encouraging positive social and familial norms that prioritise needs of young people, strengthening justice systems and providing support services Fostering skills related to resilience and coping in young people to facilitate responses to acute interpersonal stressors Involving partners and families (particularly parents) in the treatment of affected individuals, and building support within the family Developing alternative social networks such as community centres and sports clubs

Limitations

A major limitation of the study is that it is prone to selection bias. This can arise in two ways. First, the low response-rate in controls suggests a non-representative sample, and the possibility of having included controls that were healthier or more reachable than those who refused, which may have led to inflated effect sizes of some of the factors. Second, more female than male cases refused participation, and this may have led to us to overlook or underestimate factors that disproportionately affect women, particularly if they are in some way associated with reasons for refusal. Thus, although we matched cases and controls for gender and age, the observed associations should be interpreted with caution. Observer and recall bias may have also occurred as RAs could not be blinded to group status, and cases may have had greater motivation to recall experiences than controls. However, we took steps to minimise these by standardising data collection and coding procedures; selecting controls from a comparable (hospital-going) population; restricting the time frame for assessment of most factors to the last 12 months or lesser; conducting interviews soon after the hospital visit (typically within 2 days, for cases *and* controls); and monitoring data quality [94]. Next, our sample was rather small for developing a very stable model of factors. The precision of some of the estimated OR was poor; for example, the number of controls who had no social interactions was only 5, which led to a very wide CI in the final model. By choosing complete case analysis, we may have further reduced our sample size; since missing values were mostly in case participants, we may have also failed to uncover or underestimated some risk factors. We also realise that in combining related variables for the multivariate analysis, we may have lost some valuable information (for example, meaningful distinctions between depression and anxiety or between partner and family problems); however, this decision allowed us to minimise the number of factors in the model and maximise our chances of detecting important effects (that may have otherwise neutralised each other), without losing important variables. We were also unable to explore the role of mental disorders or adversities such as abuse or neglect during childhood. However, we believe that including symptom inventories and more 'objective' adversities reduced chances of differential recall and improved the accuracy of our data. Although maternal education is a widely used proxy indicator for SES in India, we acknowledge that SES is a multifaceted concept

- which overlaps with living conditions, media access, literacy and employment - and that by relying solely on this, we cannot provide a complete picture of a family's wealth or resources.

Finally, we only included persons who were hospitalised for their suicide attempts. Compared to others who attempt suicide, inpatients typically tend to have more medically serious attempts i.e., they need medical intervention beyond an emergency room visit [66, 95], and have clinical and psychological characteristics that more closely resemble that of those who die by suicide [96, 97]. Therefore, our findings do not apply to outpatients or to those who self-harm in the community. Our recruitment was also confined to a single, public hospital in urban India, primarily attended by low-income groups, and therefore, our findings need to be investigated in other settings and populations.

Conclusion

To the best of our knowledge, this is the largest case-control study to examine associations between a number of factors and suicide attempts in young persons in India. By focusing only on inpatients, we identify factors that are more proximal to suicide than that of other hospital studies or community-based surveys. Our results lend strong support for employing a multifactorial approach towards suicide prevention. We encourage future research studies to utilise a more diverse sample of participants from multiple hospitals or community settings, and employ additional strategies to facilitate participation from eligible individuals.

Abbreviations

NLE	Negative Life Events
SES	Socio-Economic Status
PHQ	Patient Health Questionnaire
GAD	Generalized Anxiety Disorder
AUDIT	Alcohol Use Disorders Identification Test
BIS	Barratt Impulsiveness Scale
OR	Odds Ratio
VIF	Variance Inflation Factor
IMV	Integrated motivational–volitional model

Supplementary Information

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Supplementary Material 1

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Author contributions

MB, VP, SP, MRP, and LV designed the research. MB conducted the study, analysed the data and drafted the manuscript. SP-YCMH and KM assisted with data analysis. AKS and KM coordinated and carried out recruitment and data acquisition. GB guided the statistical analysis. SP-YCMH and MS provided access to participants and oversaw recruitment. GB, TK, KC, SP, MRP, LV and VP contributed to the interpretation of data and substantially revised the manuscript. All authors reviewed and approved the final version of the manuscript.

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Data availability

The data generated or analysed during this study are included in this published article and its supplementary information files. The datasets analysed during the study will be available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

All persons participated voluntarily, after receiving comprehensive information translated into the local languages. Consenting individuals provided written consent. For persons younger than 18 years, legal guardians gave consent. All persons were free to refuse participation or leave the interview at any given time. The study was approved by the Institutional review Board of Sangath, the organisation conducting the study (IRB registration number - ECR/235/indt/GA/2015; project registration number – MB_2017_28; date of approval – 19.08.2017).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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