

# Suicidal ideation and attempts among men who inject drugs in Delhi, India: psychological and social risk factors

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## Abstract

**Objective** Suicide is major public health problem in India. The objective of the analyses presented in this paper is to examine depressive and anxiety symptoms and socio-demographic indicators as correlates of suicidal ideation and attempts among people who inject drugs (PWID), a high-risk group for suicide.

**Method** We analysed data collected in April–May of 2012 from a community-based sample of 420 PWID in Delhi using time location sampling. Self-report symptom scales were used to measure the severity of symptoms of depression (PHQ-9) and anxiety (GAD-2) within the preceding 2 weeks. We assessed the presence of suicidal thoughts within the past 12 months.

**Results** Depressive and anxiety symptoms were associated with suicidal ideation, as were a range of social stressors including poor physical health, length of injecting drug use, housing insecurity, and experiences of violence

and sexual abuse. However, depressive and anxiety symptoms were not associated with suicide attempts. Factors associated with suicide attempts among ideators were housing insecurity and relational dynamics including a poor relationship with family and, interestingly, being married.

**Conclusion** Suicide prevention interventions among this population should address not only individual mental health and addiction support needs but also the overwhelmingly poor psychosocial circumstances of this group.

**Keywords** India · Suicide · Substance abuse, intravenous · Mental health

## Background

In India, suicide causes approximately twice the number of deaths as HIV/AIDS, and about the same number as maternal deaths in young women, yet suicide attracts relatively less public health attention [1]. A nationally representative study found that in 2009 there were approximately 187,000 suicide deaths, with an estimated suicide death rate among people aged 15 and older of 22/100,000 [1], among the highest in the world.

Suicidal behaviour is believed to occur on a continuum, whereby suicide completion is preceded by suicidal ideation, plans, and attempts [2]. For every suicide death there is estimated to be up to 20 times as many suicide attempts [3]. Studies in India and elsewhere have repeatedly shown that suicidal ideation and past attempts are significant predictors of suicide completion [4, 5]. To develop appropriate suicide prevention strategies it is important to improve our understanding of factors associated with suicidal ideation and attempts.

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There are a range of models and theories that explain suicidal behaviour. Durkheim's classic sociological theory on suicide purports that modern urban life disrupts social cohesion/integration resulting in a greater risk of suicide [6]. A more recent explanatory model of suicide is the stress–diathesis model that identifies cognitive and social factors as necessary antecedents that increase vulnerability to stress, followed by stressful life events that trigger suicidal behaviour [7]. In addition, there are debates about cultural variations in the causes of suicide. In the Western literature, poor mental health, primarily depression, is understood to be the primary cause of suicide [5, 8]. In the Indian literature, social, economic and cultural factors are given greater emphasis as factors contributing to suicide, with claims that impulsivity and social stressors play a far greater causal role in India compared to the West [9, 10].

#### Suicidal thoughts and behaviour among people who inject drugs

Suicide is a major public health challenge for those working with people who inject drugs (PWID). Elevated rates of suicidal behaviour have been documented in connection with opioid dependence [11]. The proportion of deaths among heroin users attributed to suicide is estimated to range from 3 to 35 %, and a meta-analysis found heroin users were 14 times more likely than matched peers to die from suicide [11, 12]. Given the risk of overdose associated with injecting of opioids, PWID engage regularly in behaviour that sees them “balancing on the edge of death” [13]. Consequently, it is difficult to determine the extent of deliberate intention to die in cases of fatal drug overdose.

Studies in Western settings have documented high levels of symptoms of psychopathology among PWID [14, 15], and have identified symptoms of depression and anxiety as important risk factors for suicidal ideation and attempts [16]. Darke and Ross [11] undertook a review of suicide risk factors among opioid addicts in predominantly Western settings. Other than poor mental health, factors associated with suicidal behaviour included sexual, physical and emotional abuse, homelessness, lower educational status, parental psychopathology, parental substance misuse, poor physical health, social isolation, longer injecting career and heavier alcohol use. These risk factors roughly parallel those for the general population but importantly they are more common among PWID [11].

Few studies have examined the phenomenon of psychopathology and/or suicidal ideation among PWID in Asian country settings [17]. To the best of our knowledge, there has been only one community-based study in India that measured suicidal ideation among PWID and that was in the context of a study on human rights abuses, revealing that roughly 50 % of PWID in Delhi experienced suicidal

ideation [18]. There have been no community-based studies among PWID in India examining the psychological and social correlates of suicidal ideation and attempts.

The population of PWID in Delhi, estimated to be around 35,000 [19], are from various walks of life, but most are substantially alienated and impoverished [20]. Many are part of the rural–urban migration phenomenon that fuels the city's rapid population growth, adding further complexity to their socio-demographic profile [20]. Through migration, Delhi has become one of the world's megacities and is now home to 16.7 million people. The large flow of migrants from rural areas to urban slums has contributed to poor social and health conditions and great socioeconomic stress for many, in addition to fracturing of family systems and a consequent struggle to meet role obligations, all of which contribute to poor mental health and suicide [21].

This paper reports on analyses of data from a cross-sectional survey measuring suicidal ideation and attempts and depressive and anxiety symptoms among adult males who inject drugs and live in Delhi. Our study of PWID in Delhi revealed a very marginalised group of men who have been injecting for a long time, with a high prevalence of recent symptoms of depression, anxiety, and suicidal ideation and attempts; the descriptive findings have been reported in a previous publication [20]. We also previously reported that symptoms of depression, anxiety and suicidal ideation each had a distinctive relationship with risky injecting and sexual practices [22]. The objective of the analyses presented in this paper is to examine depressive and anxiety symptoms and socio-demographic indicators as correlates of suicidal ideation and attempts among men who inject drugs in Delhi.

#### Methods

In April and May of 2012, a cross-sectional survey was undertaken among PWID in Delhi using a structured questionnaire that was interviewer-administered. Ethics approval was provided in Australia by the Human Research Ethics Committee at The University of Melbourne (HREC 1137025). Local ethics approval was provided in India by the Institutional Review Board (IRB) at Sharan, The Society for Service to Urban Poverty. Sharan is an NGO that provides services to injecting drug users in Delhi.

#### Participants

Participants were aged 18 years or older, had injected drugs at least once in the past month, were not currently enrolled in opioid substitution therapy (i.e. buprenorphine), and had given informed oral consent to participate in the

study. A consent form and plain language statement were read to potential participants, as literacy was limited, and consent was obtained orally after reading out the consent form. Participation in the study was voluntary and anonymous. Participants were provided with a small meal (e.g. chai and samosa) for their time in participating in the study.

### Sampling

Participants were sampled from needle and syringe programmes (NSPs) in Delhi. We sampled from three NSPs coordinated by our NGO study partner (Sharan), each in a distinctly different geographical location so that a diverse range of PWID from across Delhi were recruited: Yamuna Bazar, Nabi Karim, and Jahangirpuri. Yamuna Bazar is located on the bank of the Yamuna River in central Delhi and is the base for a large proportion of the capital's homeless and PWID. Jahangirpuri is a slum resettlement colony on the outskirts of metropolitan Delhi. The NSP at Nabi Karim is located in an urban ghetto in the Muslim quarter adjacent to New Delhi Railway Station.

We used time location sampling (TLS), a recognised method for obtaining a probability-based sample from hidden populations [23], and our methodological approach has been detailed in a previous papers [20, 22]. In brief, the three NSP operating hours were mapped and a list was constructed based on a combination of the locations (i.e. NSPs) and blocks of time during which the NSPs would be operating. Combinations of location and time (i.e. primary sampling units) were then randomly selected from the list to populate a sampling calendar; combinations of location and time were known as sampling events. During sampling events, the data collection team approached potential participants immediately after they had obtained new injecting equipment from the NSP. As many interviews as possible were conducted during each sampling event. Sampling continued according to the sampling calendar until the desired sample size was achieved. One member of the data collection team was given the enumerator role and they used a “counter” to collect data on the number of people who used the NSP during the sampling event and the number of people actually interviewed to enable the construction of selection probability weights.

### Data collection and measurement

The questionnaire was interviewer-administered to maximise the quality of the data collected. Many of the participants had not received any schooling so the questionnaire was kept as brief and simple as possible and took approximately 30 min to complete. The questionnaire was translated into Hindi, back-translated into English and

then piloted in the field to ensure equivalence and appropriateness of the questions and scales.

### *Socio-demographics and injecting drug use*

Questions regarding socio-demographics and injecting drug use were adapted from previous research among PWID in Delhi [18] and from a sub-set of questions from the integrated biological and behavioural assessment (IBBA) survey previously undertaken among PWID in three states of India [24].

### *Symptoms of depression and anxiety and suicidal ideation and attempts*

Suicidal ideation and attempts were captured by questions adapted from the Suicide Behaviours Questionnaire (SBQ) [25]. Participants were asked whether they had thought about killing themselves in the past 12 months, and whether they had attempted to kill themselves in the past 12 months.

Symptoms of depression were measured using the Patient Health Questionnaire (PHQ-9), a nine-item screening tool based on criteria for depressive disorders in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) [26]. The PHQ-9 has well-established criterion, construct and external validity. The PHQ-9 is relatively short to administer and has previously been translated into Hindi, validated for use among South Asian populations and used in previous studies measuring the prevalence of depression in Indian communities. The PHQ-9 asks participants whether they have been bothered with nine symptoms in the past 2 weeks, with response options on a four-point Likert scale: not at all (0), several days (1), more than half the days (2), nearly every day (3). The PHQ-9 yields scores ranging from 0 to 27. Scores of 5, 10, 15 and 20 represent thresholds marking the lower limits of mild, moderate, moderately severe, and severe depression.

The association between depression and suicidal behaviours can be confounded because suicidal ideation is one of the diagnostic criteria for depressive disorders [27]. The final item (item 9) on the PHQ-9 asks about thoughts of suicide/self-harm and so we have opted to adapt the scale by removing this final item given we are attempting to examine the association between depressive symptoms and suicidal ideation. In our multivariate analyses, we have thus used the adapted scale (i.e. the first eight items only) in continuous form as a measure of depressive symptom severity with scores ranging from 0 to 24.

Symptoms of anxiety were measured using the Generalised Anxiety Disorder (GAD-2) scale, a two-item ultra-brief screening tool that follows the same format and response options as the PHQ-9 [28]. Scores on the GAD-2

range from 0 to 6 with a score of  $\geq 3$  representing the optimum cut-point for screening for anxiety disorders. The GAD-2 has high sensitivity (86 %) and specificity (83 %) for detecting generalised anxiety disorder and high specificity for panic disorder (81 %), social anxiety disorder (81 %) and post-traumatic stress disorder (81 %) [28]. The GAD-2 has previously been translated into Hindi.

### Statistical analysis

The sample size for our analyses was 420, which was calculated to measure the prevalence of psychological distress with a 95 % confidence interval, a 5.5 % margin of error, and accounting for a design effect of 1.25. All analyses were conducted in Stata version 10 using survey commands to account for unequal probability of selection and to adjust the standard errors to account for clustering by sampling event. Sampling events at different times but at the same location were treated as separate clusters. The number of attendees at a sampling location during each sampling event (i.e. enumeration count) was used to construct selection probability weights. More weight was given to participants recruited at highly attended sampling events. We used multivariate regression analyses to examine the association of suicidal ideation and attempts with depressive and anxiety symptoms and socio-demographic indicators. There was a moderate correlation (Pearson's  $r = 0.438$ ,  $p = <0.001$ ) between the scores on the adjusted PHQ depressive symptom scale and scores on the GAD-2 scale, and so an interaction term was used in the regression analyses to see if there is a synergistic effect of comorbidity. Multivariate binary logistic regression analyses were conducted on the likelihood of suicidal ideation in the preceding 12 months, and on the likelihood of a suicide attempt in the preceding 12 months among the whole sample and among the sub-sample of participants who reported suicidal ideation.

## Results

### Participant characteristics

The mean age was 36.7 years (SD 11.6, range 19–80) and the mean length of injecting drug use was 20.9 years (SD 10.8, range 3–61). The main drug injected in the last 3 months was buprenorphine (76.9 %; 95 % CI 69.7–84.1 %), a synthetic opioid analgesic, followed by heroin (18.0 %; 95 % CI 11.6–24.3 %) and other drugs (5.2 %; 95 % CI 1.7–8.6 %). Heroin and buprenorphine were commonly injected in a cocktail with a liquid antihistamine and often diazepam as well. The mean number of injections per week was 17.5 (95 % CI 16.6–18.3), and few

**Table 1** Participant characteristics ( $n = 420$ )

Characteristic	% (95 % CI)
Current age: years (mean 36.7)	
18–24	11.3 (7.1–15.6)
25–44	63.1 (55.8–70.3)
45+	25.6 (19.8–31.4)
Place of birth	
New Delhi	38.3 (26.7–50.0)
Uttar Pradesh	27.9 (22.2–33.6)
Other	33.7 (25.2–42.3)
Literacy	
Illiterate	62.2 (56.7–67.6)
Literate	37.8 (56.7–67.6)
Place slept most of the time in past 3 months	
Own house or flat	5.9 (1.6–10.2)
Homeless/temporary housing	72.4 (60.1–84.1)
House/flat of relative or friend	16.0 (8.6–23.4)
Rented room	5.7 (3.1–5.3)
Daily income: rupees (mean = 193.5)	
192 rupees or less	48.8 (42.7–54.9)
193 rupees or more	51.2 (45.1–57.3)
Current marital status	
Never married	53.3 (46.4–60.1)
Currently married	24.6 (22.0–30.9)
Widowed/separated/divorced	22.1 (17.2–27.0)
Personal rating of relationship with family	
Good	16.5 (12.1–20.9)
Average	43.0 (37.7–48.4)
Poor	40.4 (34.9–46.0)
Beaten up in last 6 months	
No	50.7 (44.5–57.0)
Yes	49.3 (43.0–55.5)
Ever been forced or coerced into sex	
No	84.2 (80.1–88.3)
Yes	15.8 (11.7–19.9)
Frequency of alcohol use	
Less than weekly	73.9 (68.0–79.9)
Weekly	26.1 (20.1–32.0)
Rating of overall personal health	
Average to good	49.7 (44.6–54.8)
Poor	42.4 (36.2–48.6)
No. of times injected in past week (mean = 17.5)	
16 or less	49.7 (44.6–54.8)
17+	50.3 (45.2–55.4)
Length of injecting drug use: years (mean = 20.9)	
0–10	13.4 (8.9–17.9)
11–20	42.3 (36.4–48.3)
21+	44.3 (39.7–48.8)
Depression symptom severity <sup>a</sup>	
Mild or none (PHQ-9: <10)	15.6 (10.8–20.4)

**Table 1** continued

Characteristic	% (95 % CI)
Moderate (PHQ-9: 10–14)	30.2 (24.2–36.2)
Moderately severe (PHQ-9: 15–19)	36.8 (30.8–42.8)
Severe (PHQ-9: $\geq 20$ )	17.4 (10.7–24.1)
Anxiety symptoms <sup>b</sup>	
No (GAD-2: $< 3$ )	29.5 (23.2–35.7)
Yes (GAD-2: $\geq 3$ )	70.5 (64.3–76.8)
Suicidal ideation: have you thought about killing yourself in the past 12 months?	
No	46.9 (41.9–52.0)
Yes	53.1 (48.0–58.1)
Suicide attempts: have you attempted to kill yourself in the past 12 months?	
No	63.8 (58.6–68.9)
Yes	36.3 (31.1–41.4)

<sup>a</sup> PHQ-9 scores of  $\geq 10$ ,  $\geq 15$  and  $\geq 20$  represent cut-offs for moderate, moderately severe and severe depression symptomatology

<sup>b</sup> A GAD-2 score of  $\geq 3$  represents the optimum cut-off when screening for anxiety

(14 %) were injecting only once a day or less. Additional socio-demographic characteristics are displayed in Table 1.

According to scores on the PHQ-9, 54 % of the sample had a moderately severe or severe level of depressive symptoms (cut-off  $\geq 15$ ). The mean score on the PHQ-9 scale was 14.7 out of a total possible score of 27, with a range of 1–25 and a median of 15. The mean score on the adjusted PHQ scale (without the ninth item pertaining to suicidal ideation/self-harm) was 13.1 (95 % CI 12.2–13.9) out of a total possible score of 24, with a median of 13 and a range of 1–22. Seventy-one percent qualified as having anxiety symptomatology (cut-off score of  $\geq 3$ ). The mean score on the GAD-2 scale was 3.4 (95 % CI 3.2–3.7) out of a total possible score of 6, with a median of 4 and a range of 0–6.

Suicidal ideation and attempts during the preceding 12 months were common. Fifty-three percent thought about killing themselves and almost one-quarter either often (15 %) or very often (7 %) thought about killing themselves. A substantial proportion had attempted to kill themselves (36 %) in the past 12 months. Almost two-thirds (65 %) of participants experiencing suicidal ideation had attempted suicide, and only three participants attempted suicide who did not also report suicidal ideation.

#### Factors associated with suicidal ideation in the preceding 12 months

The binary logistic regression model for suicidal ideation in the preceding 12 months appears in Table 2. Participants

who were homeless (OR = 4.8) or sleeping in the house of a friend or relative (OR = 4.6) were at least four and a half times more likely to experience suicidal ideation compared to those who mostly slept in their own house or flat. The odds of experiencing suicidal ideation were roughly two times higher for participants who had been beaten up in the preceding 6 months (OR = 2.1), had ever been forced or coerced into sex (OR = 2.8), or had rated their overall personal health as poor (OR = 1.9). Participants who had been injecting drugs for 21 or more years were at least three times more likely to experience suicidal ideation compared to those who had been injecting for 10 or less years (OR = 3.3). Each additional point on the adapted PHQ scale (max possible range 0–24) increased the odds of suicidal ideation by 20 % (OR = 1.20) and each additional point on the GAD-2 scale (max possible range 0–6) increased the odds of suicidal ideation by 90 % (OR = 1.92). The interaction term between depression and anxiety symptom severity approached statistical significance with an odds ratio below one (OR = 0.96,  $p = 0.071$ ) suggesting that there was no compounding effect of symptoms of psychological distress when depression and anxiety symptoms were comorbid.

Further, the above primary binary logistic regression model was repeated using depressive and anxiety symptoms in dichotomous form with high cut-off thresholds. Severe depressive symptoms (i.e.  $\geq 20$  on unadjusted PHQ-9) and median or worse anxiety symptoms (i.e.  $\geq 4$  on GAD-2) were associated with suicidal ideation in both univariate (depression OR = 2.4,  $p = 0.029$ ; anxiety OR = 1.5,  $p = 0.033$ ) and multivariate analyses (depression OR = 9.9,  $p = 0.027$ ; anxiety OR = 1.7,  $p = 0.034$ ). Again, the interaction term approached statistical significance (OR = 0.13,  $p = 0.057$ ).

#### Factors associated with suicide attempts in the preceding 12 months

The binary logistic regression model for suicide attempts in the preceding 12 months among people experiencing suicidal ideation appears in Table 3. Symptoms of depression and/or anxiety were not associated with suicide attempts among this group. Participants who were homeless (OR = 6.5) or sleeping in the house of a friend or relative (OR = 3.2) were six and three times more likely to attempt suicide respectively compared to those who mostly slept in their own house or flat. The odds of attempting suicide were roughly 70 % less for participants who had never been married (OR = 0.35) or who were widowed, separated or divorced (OR = 0.24) compared to those who were currently married. In addition, participants who reported a poor relationship with family were almost four times more likely to attempt suicide (OR = 3.9). Taking



**Table 2** Binary logistic regression for suicidal ideation in preceding 12 months ( $n = 420$ )

Characteristic	% Suicidal ideation	Unadjusted odds ratio	95 % CI		<i>p</i> value	Adjusted odds ratio	95 % CI		<i>p</i> value
Current age (years)									
18–24	46.1	1				1			
25–44	52.8	1.31	0.50	3.39	0.564	0.86	0.23	3.16	0.814
45+	56.8	1.54	0.64	3.70	0.318	1.46	0.34	6.19	0.593
Place of birth									
New Delhi	51.8	1				1			
Uttar Pradesh	54.3	1.11	0.56	2.17	0.755	0.86	0.46	1.59	0.608
Other	53.5	1.07	0.64	1.78	0.786	0.66	0.39	1.10	0.106
Literacy									
Illiterate	55.5	1				1			
Literate	49.0	0.77	0.51	1.15	0.192	0.85	0.50	1.45	0.539
Place slept most of the time in past 3 months									
Own house or flat	33.0	1				1			
Homeless/temporary housing	55.9	2.57	1.65	4.02	<0.001	4.81	1.85	12.46	0.003
House/flat of relative or friend	52.2	2.21	1.16	4.25	0.019	4.56	1.98	10.46	0.001
Rented room (hotel or rooming house)	39.9	1.34	0.51	3.56	0.533	2.47	0.74	8.29	0.135
Daily income: rupees									
192 rupees or less	47.9	1				1			
193 rupees or more	58.0	1.50	1.03	2.20	0.038	1.67	0.93	2.99	0.080
Current marital status									
Currently married	51.9	1				1			
Never married	50.4	0.94	0.61	1.46	0.780	0.75	0.37	1.50	0.389
Widowed/separated/divorced	60.8	1.44	0.91	2.29	0.116	0.74	0.43	1.29	0.274
Personal rating of relationship with family									
Good	39.7	1				1			
Average	51.6	1.62	0.76	3.47	0.199	1.15	0.52	2.54	0.716
Poor	60.0	2.28	1.22	4.29	0.013	1.03	0.44	2.43	0.944
Beaten up in last 6 months									
No	41.6	1				1			
Yes	64.8	2.58	1.68	3.98	<0.001	2.14	1.28	3.59	0.006
Ever been forced or coerced into sex									
No	49.2	1				1			
Yes	73.4	2.85	1.83	4.42	<0.001	2.82	1.37	5.83	0.007
Frequency of alcohol use									
Less than weekly	49.8	1				1			
Weekly	62.5	1.68	1.03	2.76	0.040	1.43	0.82	2.51	0.198
Rating of overall personal health									
Average to good	43.4	1				1			
Poor	66.2	2.55	1.55	4.21	0.001	1.87	1.12	3.12	0.020
No. of times injected in past week									
16 or less	45.2	1				1			
17+	60.8	1.88	1.20	2.94	0.008	1.75	0.89	3.45	0.099
Length of injecting drug use: years									
0–10	33.6	1				1			
11–20	50.8	2.04	0.98	4.24	0.057	2.24	0.87	5.76	0.089
21+	61.2	3.11	1.65	5.86	0.001	3.30	1.28	8.53	0.016
Depressive symptom severity scale		1.13	1.05	1.21	0.003	1.20	1.00	1.43	0.046
Anxiety symptom severity scale		1.27	1.12	1.43	0.001	1.92	1.14	3.22	0.016
Interaction: depressive × anxiety symptoms						0.96	0.93	1.00	0.071

into account the reduced power of this sub-group analysis due to the smaller sample size ( $n = 218$ ), other variables associated with suicide attempts that had sizable odds ratios approaching statistical significance included a history of being forced or coerced into sex (OR = 2.3,  $p = 0.067$ ), a greater frequency of alcohol use (OR = 2.5,  $p = 0.084$ ), and poor physical health (OR = 2.2,  $p = 0.068$ ).

An additional binary logistic regression model was run predicting suicide attempts among the whole sample (not just suicidal ideators) for the purposes of comparing with the relevant literature examining mental health and suicide attempts. While symptoms of depression and anxiety were associated with suicide attempts in univariate analysis (depression OR = 1.1,  $p = 0.001$ ; anxiety OR = 1.2,  $p = 0.008$ ), neither remained statistically significant in multivariate analysis (depression OR = 1.1,  $p = 0.525$ ; anxiety OR = 1.3,  $p = 0.518$ ); the interaction term for depressive and anxiety symptoms was also not significant (OR = 0.99,  $p = 0.834$ ).

Further, the primary binary logistic regression model predicting attempts among ideators was repeated using depressive and anxiety symptoms in dichotomous form with high cut-off thresholds. Severe depressive symptoms (i.e.  $\geq 20$  on unadjusted PHQ-9) and median or worse anxiety symptoms (i.e.  $\geq 4$  on GAD-2) were not associated with suicide attempts among ideators in either univariate (depression OR = 1.4,  $p = 0.507$ ; anxiety OR = 1.1,  $p = 0.777$ ) or multivariate analyses (depression OR = 4.0,  $p = 0.228$ ; anxiety OR = 1.1,  $p = 0.811$ ); the interaction term was also not statistically significant (OR = 0.2,  $p = 0.285$ ).

## Discussion

Our community-based survey of men who inject drugs in Delhi revealed an impoverished, vulnerable and isolated group of men whose lives are shaped by a significant level of psychological and social distress. The average length of injecting drug use was a striking 21 years, indicative of a group of people struggling with chronic addiction. Suicidal thoughts and acts were disconcertingly common; one-half had thought about killing themselves and one-third had attempted to kill themselves in the preceding 12 months.

### Mental health and suicide

We found that depressive and anxiety symptoms were associated with suicidal ideation, even after controlling for a range of important psychosocial stressors. Poor mental health could be contributing to increased vulnerability and poorer coping capacity in relation to stress and adverse life

events. This result is consistent with the literature that identifies poor mental health as an important risk factor for suicide. Cavanagh et al. [8] drew on Western studies using psychological autopsy methods and concluded that psychiatric disorders are present in about 90 % of people who kill themselves. Studies among PWID in Western settings have also identified that symptoms of depression and anxiety are associated with suicidal ideation among PWID. For example, research in Baltimore (USA) found a high prevalence of suicidal ideation (31 %, preceding 6 months) among PWID and that those with severe depressive symptoms were 10 times (OR = 10.7) more likely to report suicidal ideation in the past 6 months [29].

While symptoms of depression and anxiety were associated with suicidal ideation, they were not associated with suicide attempts neither among our whole sample nor among the sub-group of ideators. This is in contrast to other studies of PWID in Western settings that found an association between psychological distress and suicide attempts [16, 30]. However, these studies did not look at predictors of suicidal attempts among those reporting ideation. Although not directly comparable to our survey of PWID in Delhi, it is interesting to note that a large national population health survey in Australia produced a similar finding noting that unemployment, poor physical health and relationship difficulties were associated with suicide attempts among ideators while symptoms of depression and anxiety were not [31]. The literature on suicide behaviour in Western settings is evolving an understanding of depression as more useful for predicting suicidal ideation rather than identifying which ideators will attempt suicide. For example, Nock et al. [32] examined data from a nationally representative household survey in the USA and found that depression predicted suicidal ideation but not attempts among ideators; mental disorders characterised by agitation and poor impulse control were better predictors of those ideators who made a suicide attempt. The authors hypothesised that some mental disorders may increase the desire for suicide while others may elevate the likelihood of the person actually acting on the desire.

### Social stress and suicide

A range of social stressors were strongly associated with both suicidal thoughts and attempts. In fact, it was social stressors that appeared to be providing the added stimulus behind suicide attempts. This finding is relevant to the claim that impulsivity and social stressors play an equally or more important role in suicide deaths in India compared to psychopathology [9, 10]. To illustrate this point, Radhakrishnan and Andrade [10] drew on government statistics to highlight the top ten listed causes or correlates of

**Table 3** Binary logistic regression for suicidal attempt in preceding 12 months, among those reporting suicidal ideation ( $n = 218$ )

Characteristic	% Suicide attempt	Unadjusted odds ratio	95 % CI		<i>p</i> value	Adjusted OR	95 % CI		<i>p</i> value
Current age (years)									
18–24	69.8	1				1			
25–44	69.0	0.97	0.31	3.01	0.950	0.75	0.14	4.04	0.726
45+	58.5	0.61	0.25	1.52	0.272	0.33	0.05	1.96	0.207
Place of birth									
New Delhi	69.8	1				1			
Uttar Pradesh	69.0	1.00	0.48	2.07	0.991	0.67	0.28	1.62	0.354
Other	58.5	0.93	0.44	1.93	0.832	0.56	0.19	1.63	0.273
Literacy									
Illiterate	70.8	1				1			
Literate	57.6	0.56	0.30	1.03	0.061	0.90	0.38	2.11	0.799
Place slept most of the time in past 3 months									
Own house or flat	42.9	1				1			
Homeless/temporary housing	68.5	2.89	1.00	0.84	0.050	6.54	1.49	28.68	0.015
House/flat of relative or friend	63.1	2.27	0.73	7.10	0.148	3.23	1.03	10.08	0.045
Rented room (hotel or rooming house)	57.0	1.76	0.33	9.29	0.486	2.82	0.39	20.35	0.286
Daily income: rupees									
192 rupees or less	68.6	1				1			
193 rupees or more	64.3	0.83	0.44	1.54	0.527	0.81	0.36	1.82	0.594
Current marital status									
Currently married	65.6	1				1			
Never married	72.3	0.73	0.38	1.38	0.316	0.35	0.14	0.86	0.025
Widowed/separated/divorced	61.8	0.62	0.25	1.53	0.281	0.24	0.08	0.73	0.015
Personal rating of relationship with family									
Good	47.9	1				1			
Average	60.1	1.63	0.68	3.92	0.256	2.32	0.81	6.63	0.109
Poor	76.8	3.59	1.34	9.68	0.014	3.93	1.27	12.14	0.020
Beaten up in last 6 months									
No	60.1	1				1			
Yes	69.7	1.48	0.78	2.82	0.219	1.11	0.47	2.63	0.807
Ever been forced or coerced into sex									
No	63.5	1				1			
Yes	75.9	1.81	0.96	3.44	0.066	2.30	0.94	5.63	0.067
Frequency of alcohol use									
Less than weekly	62.6	1				1			
Weekly	74.5	1.74	0.89	3.44	0.102	2.46	0.88	6.91	0.084
Rating of overall personal health									
Average to good	53.2	1				1			
Poor	77.9	3.10	1.45	6.62	0.006	2.18	0.94	5.04	0.068
No. of times injected in past week									
16 or less	60.0	1				1			
17+	70.1	1.61	0.86	3.02	0.128	0.98	0.47	2.05	0.953
Length of injecting drug use: years									
0–10	75.9	1				1			
11–20	62.1	0.52	0.17	1.58	0.234	0.46	0.07	2.96	0.392
21+	67.9	0.67	0.23	1.96	0.446	0.74	0.09	6.06	0.772
Depressive symptom severity scale									
Anxiety symptom severity scale		1.05	0.98	1.13	0.166	0.85	0.65	1.12	0.230
Interaction: depressive × anxiety symptoms		1.12	0.81	1.53	0.475	0.53	0.16	1.74	0.278
						1.06	0.97	1.15	0.192



suicide in India, which included: family problems, illness, mental illness, unemployment, love affairs, drug abuse/addiction, exam failure, bankruptcy or sudden change in economic status, poverty, and dowry disputes. Additional causes were: impotency/barrenness, suspected/illicit relations, divorce, illegitimate pregnancy, physical and sexual abuse, and professional/career problems. Given the extreme levels of social disadvantage among our participants it is not surprising that social factors made a substantial contribution to suicide risk. It would be presumptive to make strong inferences regarding the relative contribution of social versus psychological factors based on our survey findings, particularly as it is probable that both of these factors coalesce to create the disconcertingly high level of suicidal thoughts and attempts.

We identified several social stressors associated with suicidal ideation among PWID in Delhi including poor physical health, length of injecting drug use, experiences of violence, sexual abuse and housing insecurity. Housing insecurity was also associated with suicide attempts among ideators, with those who were homeless or sleeping at the home of a relative or friend being at greater risk than those few who had their own accommodation. Sexual abuse, a higher level of alcohol use and poor physical health also influenced suicide attempts among ideators in our sample (although not quite reaching statistical significance). All of these suicide risk factors have been identified in other research among PWID [11]. In particular, the association found between sexual abuse and suicide is consistent with prior studies examining suicide attempts among PWID [33, 34].

An important finding in our study is that the quality of family relationships were not associated with suicidal thoughts, but were strongly associated with suicide attempts among ideators. Those who reported a poor relationship with family (40 % of participants) were more likely to have attempted suicide in the preceding 12 months. Mattoo et al. [35] detailed the severe family disruption connected with opioid dependence in India. Family is the core of Indian social fabric and the key source of care and social inclusion [36]. Narratives of distress are almost exclusively located within the domain of the family with particular emphasis on family problems, role strain and difficulties associated with marriage [37]. The heightened level of stigma, shame and alienation associated with injecting drug use in a conservative Indian society threatens the integrity of the family and fractures family relationships [38]. It is also plausible that a history of poor mental health within the family (not measured in this study) contributes directly or indirectly to poor family relationships, poor mental health of the individual PWID and his greater risk of suicide, and perhaps even to the initiation of drug use.

Interestingly, those who were currently married were also more likely to have attempted suicide compared to those who were separated, divorced, widowed or had never been married. Marriage is usually understood to protect against suicide, particularly for men, based on findings from studies in Western settings [39]. However, research undertaken in India yields mixed findings regarding the relationship between marital status and suicide for both men and women, suggesting that either marriage is not a protective factor for suicide attempts, or indeed that the risk of suicide is higher among those who are married [40, 41]. When understood in the Indian context, it is likely that poor family relationships and the ensuing role strain/failure and shame experienced by many of those dependent on illicit opioids play a causal role in relation to suicide attempts among PWID in Delhi. Furthermore, the social deprivation experienced by many PWID in Delhi could compound any marital role strain/failure arising in relation to opioid dependence.

#### Implications for suicide prevention

Suicide is a real and urgent risk for PWID in Delhi. Consideration should be given to health and social support interventions that ameliorate factors associated with suicidal thoughts including poor mental health, poor physical health, sexual abuse and experiences of violence. PWID who report suicidal ideation in addition to housing insecurity and/or family relationship disruption could be identified as being at greatest risk of suicide.

The Western biomedical model highlights depression and other psychiatric illnesses as the primary cause of suicide [5, 8]. However, the debate about how to focus suicide prevention efforts in India is divided. While some are agitating for greater attention to mental health services and treatment [42], others argue that the predominant focus should be on policies to ensure that the basic human needs and rights of the population are met and that we avoid medicalising personal and social distress [43].

Jacob [43] argues for psychosocial interventions for vulnerable sections of society that provide social support and challenge a culture that accepts suicide as a way out of personal misery. As noted in our previous paper, the most commonly reported symptom of depression in our study was feelings of worthlessness and self-blame, which is not surprising given the highly stigmatised nature of injecting drug use and addiction, the family disruption and the deprived socioeconomic circumstances [20]. The severity of the impoverished and stigmatised lives of PWID in Delhi is pertinent, as is the high level of shame, given that traditional Indian texts contain stories in which suicide is glorified as an option for avoiding shame and disgrace; a cultural history that is considered critical to understanding suicide in India today [10].

## Limitations

There are a number of study limitations that should be mentioned. Firstly, as with all cross-sectional study designs, the casual nature of relationships cannot be fully determined. Reverse causality is possible whereby suicidal thoughts exacerbate or reinforce a negative or anxious mood state. Furthermore, there is a temporal limitation in that our depression and anxiety scales collected information on symptoms in the preceding 2 weeks whereas the suicidal ideation and attempt questions were in relation to the preceding 12 months; it is not possible to be certain that the depressive and anxiety symptoms existed prior to the suicidal ideation or attempts. Secondly, our study surveyed only those people who had thought about suicide and/or had made a non-fatal suicide attempt for the obvious reason that they could be interviewed, while suicide completers cannot. It is possible that this group may not be representative of those who complete suicide. Future studies on suicide among PWID in India and elsewhere would be improved by including a sample of community controls, however this was outside the scope of our study. Thirdly, symptoms of depression and anxiety were measured using symptom screening tools rather than structured clinical interviews, which would be the optimal strategy to determine lifetime and current depressive and anxiety diagnoses. It is possible that some participants were experiencing psychological distress related to their socially adverse circumstances and/or substance dependence and if clinically examined would not have satisfied diagnostic criteria for depression or anxiety. Finally, several other factors understood to be linked to suicidal behaviours were not measured and would warrant investigation in future research including family history of suicidal behaviours, traumatic life events, personality characteristics (i.e. aggression, impulsivity), and other mental disorders such as psychotic disorders and personality disorders [44]. These limitations notwithstanding, the results presented in this paper provide unique data on a topic that has been under-researched in Asia and advances our understanding of suicidal thoughts and attempts for PWID in India.

## Concluding remark

Whilst our findings support the conclusion that depressive and anxiety symptoms contribute to suicidal ideation, the chronicity of addiction as well as the overwhelming psychosocial stressors and family relationship turmoil experienced by PWID in Delhi are at the heart of the story, and could be a major focus for suicide prevention interventions.

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**Conflict of interest** The authors declare that they have no competing interests.

## References

- Patel V, Ramasundarahettige C, Vijayakumar L, Thakur JS, Gajalakshmi V, Gururaj G, Suraweera W, Jha P (2012) Suicide mortality in India: a nationally representative survey. *Lancet* 379(9834):2343–2351
- Kessler RC, Borges G, Walters EE (1999) Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Arch Gen Psychiatry* 56(7):617–626
- Diekstra RF, Gulbinat W (1993) The epidemiology of suicidal behaviour: a review of three continents. *World Health Stat Q* 46(1):52–68
- Gururaj G, Isaac MK, Subbakrishna DK, Ranjani R (2004) Risk factors for completed suicides: a case-control study from Bangalore, India. *Inj Control Saf Promot* 11(3):183–191
- Hawton K, Fagg J (1988) Suicide, and other causes of death, following attempted suicide. *Br J Psychiatry* 152:359–366
- Durkheim E (1952) *Suicide: a study in sociology*. The Free Press, Scotland
- van Heeringen K (2012) Stress-diathesis model of suicidal behaviour. In: Dwivedi Y (ed) *The neurobiological basis of suicide*. CRC Press, Florida
- Cavanagh JT, Carson AJ, Sharpe M, Lawrie SM (2003) Psychological autopsy studies of suicide: a systematic review. *Psychol Med* 33(3):395–405
- Manoranjitham SD, Rajkumar AP, Thangadurai P, Prasad J, Jayakaran R, Jacob KS (2010) Risk factors for suicide in rural south India. *Br J Psychiatry* 196(1):26–30
- Radhakrishnan R, Andrade C (2012) Suicide: an Indian perspective. *Indian J Psychiatry* 54(4):304–319
- Darke S, Ross J (2002) Suicide among heroin users: rates, risk factors and methods. *Addiction* 97(11):1383
- Harris EC, Barraclough B (1997) Suicide as an outcome for mental disorders. A meta-analysis. *Br J Psychiatry* 170:205–228
- Rosow I, Lauritzen G (1999) Balancing on the edge of death: suicide attempts and life-threatening overdoses among drug addicts. *Addiction* 94(2):209–219
- Lemstra M, Rogers M, Thompson A, Moraros J, Buckingham R (2011) Risk indicators of depressive symptomatology among injection drug users and increased HIV risk behaviour. *Can J Psychiatry* 56(6):358–366
- Perdue T, Hagan H, Thiede H, Valleroy L (2003) Depression and HIV risk behavior among Seattle-area injection drug users and young men who have sex with men. *AIDS Educ Prev* 15(1):81–92
- Darke S, Ross J, Williamson A, Mills KL, Havard A, Teesson M (2007) Patterns and correlates of attempted suicide by heroin users over a 3-year period: findings from the Australian treatment outcome study. *Drug Alcohol Depend* 87(2–3):146–152
- Iskandar S, Kamal R, De Jong CA (2012) Psychiatric comorbidity in injecting drug users in Asia and Africa. *Curr Opin Psychiatry* 25(3):213–218

18. Sarin E, Samson L, Sweat M, Beyrer C (2011) Human rights abuses and suicidal ideation among male injecting drug users in Delhi, India. *Int J Drug Policy* 22(2):161–166
19. Aceijas C, Friedman SR, Cooper HL, Wiessing L, Stimson GV, Hickman M (2006) Estimates of injecting drug users at the national and local level in developing and transitional countries, and gender and age distribution. *Sex Transm Infect* 82(Suppl 3):10–17
20. Armstrong G, Nuken A, Samson L, Singh S, Jorm AF, Kermode M (2013) Quality of life, depression, anxiety and suicidal ideation among men who inject drugs in Delhi, India. *BMC Psychiatry* 13(1):151
21. Vijayakumar L (2007) Suicide and its prevention: the urgent need in India. *Indian J Psychiatry* 49(2):81–84
22. Armstrong G, Jorm AF, Samson L, Joubert L, Nuken A, Singh S, Kermode M (2013) Association of depression, anxiety, and suicidal ideation with high-risk behaviors among men who inject drugs in Delhi, India. *J Acquir Immune Defic Syndr* 64(5):502–510
23. Magnani R, Sabin K, Saidel T, Heckathorn D (2005) Review of sampling hard-to-reach and hidden populations for HIV surveillance. *Aids* 19(Suppl 2):S67–S72
24. Indian Council of Medical Research, FHI 360 (2011) Integrated behavioural and biological assessment (IBBA), Round 2 (2009–2010), National Summary Report. Indian Council of Medical Research and FHI 360, New Delhi
25. Osman A, Bagge CL, Gutierrez PM, Konick LC, Kopper BA, Barrios FX (2001) The Suicidal Behaviors Questionnaire-revised (SBQ-R): validation with clinical and nonclinical samples. *Assessment* 8(4):443–454
26. Martin A, Rief W, Klaiberg A, Braehler E (2006) Validity of the Brief Patient Health Questionnaire Mood Scale (PHQ-9) in the general population. *Gen Hosp Psychiatry* 28(1):71–77
27. Vajda J, Steinbeck K (2000) Factors associated with repeat suicide attempts among adolescents. *Aust N Z J Psychiatry* 34(3):437–445
28. Kroenke K, Spitzer RL, Williams JB, Monahan PO, Lowe B (2007) Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. *Ann Intern Med* 146(5):317–325
29. Havens JR, Sherman SG, Sapun M, Strathdee SA (2006) Prevalence and correlates of suicidal ideation among young injection vs. noninjection drug users. *Subst Use Misuse* 41(2):245–254
30. Chen VC-H, Lin T-Y, Lee CT-C, Lai T-J, Chen H, Ferri CP, Gossop M (2010) Suicide attempts prior to starting methadone maintenance treatment in Taiwan. *Drug Alcohol Depend* 109(1–3):139–143
31. Fairweather AK, Anstey KJ, Rodgers B, Butterworth P (2006) Factors distinguishing suicide attempters from suicide ideators in a community sample: social issues and physical health problems. *Psychol Med* 36(9):1235–1245
32. Nock MK, Hwang I, Sampson NA, Kessler RC (2010) Mental disorders, comorbidity and suicidal behavior: results from the National Comorbidity Survey Replication. *Mol Psychiatry* 15(8):868–876
33. Havens JR, Strathdee SA, Fuller CM, Ikeda R, Friedman SR, Des Jarlais DC, Morse PS, Bailey S, Kerndt P, Garfein RS (2004) Correlates of attempted suicide among young injection drug users in a multi-site cohort. *Drug Alcohol Depend* 75(3):261–269
34. Braitstein P, Li K, Tyndall M, Spittal P, O’Shaughnessy MV, Schilder A, Johnston C, Hogg RS, Schechter MT (2003) Sexual violence among a cohort of injection drug users. *Soc Sci Med* 57(3):561–569
35. Mattoo SK, Nebhinani N, Kumar BA, Basu D, Kulhara P (2013) Family burden with substance dependence: a study from India. *Indian J Med Res* 137(4):704–711
36. Mullatti L (1995) Families in India: beliefs and realities. *J Comp Fam Stud* 26:11–25
37. Karasz A (2005) Cultural differences in conceptual models of depression. *Soc Sci Med* 60(7):1625–1635
38. Latkin C, Srikrishnan AK, Yang C, Johnson S, Solomon SS, Kumar S, Celentano DD, Solomon S (2010) The relationship between drug use stigma and HIV injection risk behaviors among injection drug users in Chennai, India. *Drug Alcohol Depend* 110(3):221–227
39. Kposowa AJ (2000) Marital status and suicide in the National Longitudinal Mortality Study. *J Epidemiol Community Health* 54(4):254–261
40. Latha KS, Bhat SM, D’Souza P (1996) Suicide attempters in a general hospital unit in India: their socio-demographic and clinical profile—emphasis on cross-cultural aspects. *Acta Psychiatr Scand* 94(1):26–30
41. Srivastava MK, Sahoo RN, Ghotekar LH, Dutta S, Danabalan M, Dutta TK, Das AK (2004) Risk factors associated with attempted suicide: a case control study. *Indian J Psychiatry* 46(1):33–38
42. Vijayakumar L (2005) Suicide and mental disorders in Asia. *Int Rev Psychiatry* 17(2):109–114
43. Jacob KS (2008) The prevention of suicide in India and the developing world: the need for population-based strategies. *Crisis* 29(2):102–106
44. Hawton K, van Heeringen K (2009) Suicide. *Lancet* 373(9672):1372–1381