Association of Depression, Anxiety, and Suicidal Ideation With High-Risk Behaviors Among Men Who Inject Drugs in Delhi, India

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Background: Sharing of needles and syringes and unprotected sex remain a common practice among people who inject drugs (PWID) in India and are important drivers of new HIV infections. Whether engagement in risk behaviors among PWID is associated with symptoms of common mental disorders in India is unknown.

Methods: We analyzed the data collected in April and 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 (Patient Health Questionnaire 9) and anxiety (Generalized Anxiety Disorder scale 2) within the preceding 2 weeks. We assessed the presence of suicidal thoughts within the past 12 months.

Results: PWID with severe depressive symptoms and those with suicidal thoughts were 4 and 2 times more likely to share needles/syringes, respectively. PWID experiencing suicidal thoughts had 82% more female sexual partners and were 5 times more likely to have had unprotected sex at last sex with a paid female partner. Conversely, symptoms of anxiety were associated with a 30% decrease in the likelihood of needle/syringe sharing and a 70% decrease in the likelihood of unprotected sex at last sex with a paid female partner.

Conclusions: We found a high prevalence of symptoms of depression, anxiety, and suicidal ideation among men who inject drugs in Delhi and that depression and suicidal ideation are independently positively associated with HIV risk behaviors, whereas anxiety is associated with a reduction in such behaviors. Ameliorating mental health problems among PWID in India may aid in reducing HIV infections.

Key Words: HIV prevention, mental health, depression, anxiety, suicide, India

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INTRODUCTION

Due to its large population, India is a major contributor to the South Asian HIV epidemic.[1,2] Sharing of needles and syringes remains a common practice among people who inject drugs (PWID) and is an important driver of new HIV infections within India.[3,4] Risky sexual practices are also relatively common among PWID in India[3–5] generating opportunities for HIV transmission to members of the broader community.

The population of PWID in Delhi, estimated to be at around 35,000,[6] are from various walks of life, but most are substantially alienated and impoverished and many are part of the migration phenomenon that fuels the city's rapid population growth.[7,8] The HIV prevalence among PWID in Delhi is estimated to have risen from 10.0% in 2006 to 18.6% in 2008 and HIV prevalence among PWID in the neighboring state of Punjab has increased rapidly from 13.8% in 2006 to 26.4% in 2008,[9,10] making PWID in this region an important target population for public health interventions.

The reasons why PWID engage in behaviors that put themselves and others at risk of HIV and other infections are of course multifaceted and dynamic and extend beyond rational decisions based on knowledge about risks and the provision of resources such as new needles/syringes and condoms. Personality and risk-taking attitudes play a fundamental role, as may a range of other contextual factors, including poverty, a lack of education, the severity of drug dependence, and a high frequency of injecting.[11–13]

Common mental disorders represent another factor that potentially influences injecting and sexual risk-taking behaviors among PWID.[11,14] In Western high-income countries, a high prevalence of symptoms of depression, anxiety, and suicidal ideation has been found among PWID[15–17] and observations of an association between depressive and anxiety symptoms and engagement in HIV risk behaviors have been reported.[18–21] Few studies have examined the phenomenon of common mental health problems among PWID in Asian country settings and those few that have been conducted found similarly high levels of psychiatric symptomatology.[22–25] To the best of our knowledge, there has been only

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1 community-based study among PWID in India that measured the prevalence of suicidal ideation and that was in the context of a study focused on human rights violations.[26] There have been no studies on community-based samples of PWID in India that measured symptoms of depression or anxiety and this represents an important gap in the literature. This article reports on an analysis of data from a cross-sectional survey measuring symptoms of common mental health problems among a community-based sample of adult males who inject drugs and live in Delhi. We found a heavily marginalized group of men who have been injecting for a long time with a high prevalence of symptoms of depression, anxiety, and suicidal ideation as reported in a previous publication.[8] The objective of this analysis was to evaluate the association of symptoms of depression, anxiety, and suicidal ideation with HIV risk behaviors (injecting drug use and sexual behaviors).

METHOD

Survey 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 at Sharan, The Society for Service to Urban Poverty. Sharan is an NGO that provides services to injecting drug users in Delhi. Participants were provided with a small meal (eg, chai and samosa) for their time in participating in the study. All participants in the study were provided with details for a local suicide help line, and a local psychiatrist was available for consultation should the need arise.

Eligible participants were men aged 18 years or older who had injected drugs at least once in the past month, were not currently enrolled in opioid substitution therapy (OST), and had given informed oral consent to participate in the study. Participants were sampled from needle and syringe programs (NSPs) in Delhi. There are 19 NSPs of varying size operating in Delhi, and it is estimated that approximately 80% of the PWID population usually obtain their needles from NSP-targeted interventions.[27,28] We sampled from 3 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.

We used time location sampling, a recognized method for obtaining a probability-based sample from hidden populations,[29–32] and our methodological approach has been detailed in the previous article.[8] In brief, the 3 NSPs were mapped in terms of their operating hours, and a list was constructed based on a combination of the locations (ie, NSPs) and blocks of time during which the NSPs would be operating. Combinations of location and time (ie, 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.

Research assistants with previous experience collecting data from PWID in Delhi were trained in ethical conduct of research, the sampling method, and questionnaire administration, and supervised in the field by study authors (G.A., S.S., and A.N.). The 30-minute long questionnaire was translated into Hindi, back translated into English, and piloted.

Measures

Demographics, Injecting, and Sexual Practices

Questions regarding demographics, drug use, and sexual behaviors (predominantly condom use with various partners) were adapted from previous research[33] among PWIDs in Delhi and from a subset of questions from the Integrated Biological and Behavioural Assessment survey previously undertaken among PWIDs in 3 states of India.[4]

Symptoms of Depression, Anxiety, and Suicidal Ideation

Symptoms of depression were measured using the Patient Health Questionnaire (PHQ-9).[34,35] The PHQ-9 is relatively short to administer with 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, respectively. The PHQ-9 has previously been translated into Hindi, validated for use among South Asian populations, and used in previous studies measuring the prevalence of depression among various communities in India. Symptoms of anxiety were measured using the Generalized Anxiety Disorder (GAD-2) scale, a 2-item ultra-brief screening tool.[36] Scores on the GAD-2 range from 0 to 6 with a score of ≥ 3 representing the optimum cut point with screening for anxiety. The GAD-2 has high sensitivity (86%) and specificity (83%) for detecting GAD-2 and high specificity for panic disorder (81%), social anxiety disorder (81%), and posttraumatic stress disorder (81%).[36] The GAD-2 has previously been translated into Hindi. Suicidal ideation was captured by a question adapted from the Suicide Behaviours Questionnaire.[37] Participants were asked whether they had thought about killing themselves in the past 12 months.

Sample Size

With an assumed prevalence of psychological distress of 50% (the most conservative assumption for the sample size calculation), and a 95% confidence interval (CI) with a 5.5% margin of error, it was calculated that a sample size of 312 PWID would be required. Time location sampling is similar to cluster sampling because randomly selected "blocks of

time and space" are potentially clusters of homogeneity. The required sample size was increased to 420 after adjusting for a design effect of 1.25.

Statistical Analysis

All analyses were conducted in Stata, version 10, using survey commands to account for an unequal probability of selection and to adjust the standard errors to account for clustering by a 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 the each sampling event (ie, enumeration count) was used as the basis on which to construct selection probability weights. More weight was given to participants recruited at highly attended sampling events. We used regression analyses to examine associations between risk behaviors and symptoms of depression, anxiety, and suicidal ideation. Binary logistic regression analyses were conducted on the likelihood of having shared a needle/syringe in the preceding month and the likelihood of having had unprotected sex at last sex with regular or paid female partners or male partners. The analysis did not extend to unprotected sex at last sex with casual nonpaid partners because almost all participants reported using condoms at last sex with such partners. Negative binomial regression analyses were conducted where the dependent variable took the form of count data, including the number of different needle/syringe sharing partners and the number of female sexual partners. Model specification and goodness of fit were assessed using the survey-adjusted Hosmer–Lemeshow test and the Stata command linktest.[38] Adjusted odds ratios and incident rate ratios with P values <0.05 have been highlighted in the tables.

RESULTS

Participant Characteristics

The mean age was 36.7 (95% CI: 35.5 to 37.9) and the mean length of injecting drug use was 20.9 years (95% CI: 19.8 to 22.0). The main drug injected in the last 3 months was buprenorphine (77%; 95% CI: 68% to 84%), a synthetic opioid analgesic, followed by heroin (18%; 95% CI: 12% to 24%) and other drugs (5%; 95% CI: 2% to 9%). Almost all participants had previously been tested for HIV on at least 1 occasion (96%; 95% CI: 93% to 99%).

Additional participant characteristics are displayed in Table 1. Of the participants, 47.6% had shared needles/syringes with at least 1 other injector in the preceding month and 35.8% had 2 or more female sexual partners in the preceding 6 months. Among female sexual partners in the preceding 6 months, condom use at last sex was highest with casual partners (95%) followed by paid partners (51%) and regular partners (34%). One third (37%) of the men reported a history of having had anal sex with another man, among whom just 16% used a condom the last time they had anal sex with a man. Symptoms of depression were common, with 37% having moderately severe symptoms and 17% having severe symptoms. Over two-thirds of participants qualified as having symptoms of anxiety (71%) and half (53%) had thought about killing themselves in the preceding 12 months.

Association Between Mental Health and Needle/Syringe Sharing

The binary logistic regression model for sharing a needle/syringe with at least 1 person in the preceding month appears in Table 2. The likelihood of needle/syringe sharing increased with the severity of depression and participants with severe symptoms of depression were more than 4 times more likely to share needles/syringes than those with none or mild symptoms of depression. Participants who had experienced suicidal ideation were twice as likely to engage in needle/syringe sharing. Conversely, participants experiencing symptoms of anxiety were 30% less likely to engage in needle/syringe sharing. Table 3 presents the negative binomial regression model for the number of different needle/syringe partners in the preceding month. Severe symptoms of depression increased the number of needle/syringe sharing partners by 169%. Participants who had experienced suicidal ideation shared needles/syringes with 62% more people. Conversely, participants experiencing symptoms of anxiety shared needles/syringes with 32% less people. Control variables that were significantly associated with both a greater likelihood of needle/syringe sharing in the preceding month and a higher number of needle/syringe sharing partners were younger age, a lower level of education, and a higher frequency of injecting.

Association Between Mental Health and Sexual Behavior

The binary logistic regression models for having unprotected sex at last sex with regular or paid female partners or male partners appears in Table 4. None of the mental health variables were significantly associated with unprotected sex at last sex with a regular female partner or a male partner. The odds of unprotected sex at last sex with regular partners decreased by 25% with each additional female sexual partner, suggesting that those with multiple sexual partners were less likely to be having unprotected sex with their regular partners. Participants experiencing suicidal ideation were 5 times more likely to have had unprotected sex at last sex with a paid partner. Conversely, symptoms of anxiety were significantly associated with a 70% decrease in the likelihood of unprotected sex at last sex with a paid partner. None of the control variables were significantly associated with unprotected sex at last sex with paid partners.

Table 5 presents the negative binomial regression model for number of female sexual partners in the preceding 6 months. Suicidal ideation was significantly associated with an 82% increase in the number of female sexual partners. Anxiety symptoms bordered on statistical significance ($P = 0.053$), suggesting that anxiety was associated with fewer female sexual partners. Control variables significantly associated with fewer sexual partners were a higher level of education and no source of income.

TABLE 1. Participant Characteristics (n = 420)

Characteristics	% (95% CI)
Age (yrs)	
18–24	11.3 (7.1–15.6)
25–34	34.4 (28.2–40.6)
35–44	28.7 (23.7–33.6)
45+	25.6 (19.8–31.4)
Marital status	
Never married	53.3 (46.4–60.1)
Currently married	24.6 (17.8–31.4)
Divorced/separated/widowed	22.1 (17.2–27.0)
Highest education level	
Never attended school	38.0 (32.7–43.3)
Completed between 1–4 yrs	28.0 (22.9–33.2)
Completed between 5–11 yrs	32.1 (27.4–36.8)
Completed class 12	1.8 (0.6–3.1)
Main source of income	
Skilled manual work	10.9 (6.3–15.5)
Unskilled manual work/trading or vending	20.6 (13.2–28.0)
Scavenging (eg, rag-picking)	47.8 (37.5–58.2)
Crime/begging	7.4 (4.0–10.7)
No source of income	11.1 (7.1–15.1)
Others	2.2 (0.1–3.9)
Depression symptom severity*	
Mild or none (PHQ-9: <10)	15.6 (10.8–20.4)
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: ≥20)	17.4 (10.7–24.1)
Anxiety symptoms†	
No (GAD-2: <3)	29.5 (23.2–35.7)
Yes (GAD-2: ≥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)
Duration of injecting drug use (yrs)	
0–5	2.0 (0.6–3.4)
6–10	11.4 (7.3–15.5)
11–20	42.3 (36.4–48.3)
21+	44.3 (39.7–48.8)
Number of times injected during past week	
≤7	14.4 (10.4–18.3)
8–14	28.7 (23.0–34.3)
15–21	36.4 (30.9–42.0)
22+	20.5 (15.5–25.5)
Number of people shared needles/syringes with in past month	
None	52.4 (46.7–58.1)
1–2 people	20.2 (15.5–24.9)
3–4 people	15.4 (9.9–20.9)
5+ people	12.0 (7.5–16.4)
Number of female sex (ie, vaginal or anal intercourse) partners in past 6 months	
None	41.9 (33.9–49.9)
1	22.3 (16.2–28.4)
2+	35.8 (31.6–40.0)
Female sexual partners in past 6 months	
Regular nonpaid partner	42.2 (34.1–50.4)
Casual nonpaid partner	34.8 (29.0–40.7)
Paid partner (ie, paid with money or drugs)	35.4 (29.7–41.1)
Condoms used at last sex with different types of female partners in past 6 months‡	
Regular nonpaid partner (n = 195)	33.5 (23.5–43.5)
Casual nonpaid partner (n = 147)	95.2 (91.8–98.7)
Paid partner (n = 133)	50.9 (39.8–62.0)
Male-to-male sex	
Ever had anal sex with a male partner	37.1 (30.3–43.8)
Used a condom at last anal sex with a male partner (n = 157)§	16.1 (10.7–21.4)

*PHQ-9 scores of ≥10, ≥15, and ≥20 represent cut points for moderate, moderately severe, and severe depression symptomology, respectively.

†A GAD-2 score of ≥3 represents the optimum cut point when screening for anxiety.

‡Based on a subset of those who had reported having sex with these partners: regular nonpaid partner (n = 195), casual nonpaid partner (n = 147), and paid partner (n = 133).

§Based on a subset (n = 157) of those who had reported having had sex with a male partner.

DISCUSSION

Main Findings

Our cross-sectional community-based survey of men who inject drugs in Delhi found a high prevalence of symptoms of depression, anxiety, and suicidal ideation.[8] The results of the analyses presented in this article reveal a positive association of both depressive symptoms and suicidal ideation with engagement in behaviors that place PWID and others at risk of HIV and other infections. Those who had symptoms of depression and suicidal ideation engaged in increased needle/syringe sharing. Additionally, suicidal ideation was associated with a higher number of sexual partners and a reduced likelihood of using condoms with paid female sexual partners. Interestingly, after adjusting for depressive symptoms and suicidal ideation, symptoms of anxiety seemed to have a protective effect and were associated with less needle/syringe sharing, a greater likelihood of using condoms with paid partners, and had a borderline association with fewer sexual partners.

A 2008 meta-analysis of studies primarily conducted in high-income Western countries involving clinical and community samples of PWIDs found that depression was associated with needle sharing.[18] More recent studies also in Western settings continue to suggest that depression is associated with increased needle sharing.[17,20] The links between symptoms of depression and engagement in needle sharing have been hypothesized in a number of ways in the literature and are not surprising: depression may lead to hopelessness and pessimism regarding the future and a greater level of risk taking; symptoms of depression may negatively impact on the social and negotiation skills required when navigating risky scenarios with peer injectors; and depression may impede sleep and disrupt attention span thus promoting carelessness.[14,18,21,39]

TABLE 2. Multiple Binary Logistic Regression Analysis for Sharing a Needle/Syringe With At least 1 Person in Past Month (n = 420)

Characteristic	% Shared Needle/Syringe	Adjusted Odds Ratio (95% CI)
Current age (yrs)		
18–24	71.5	1.00
25–44	48.1	**0.18 (0.06–0.57)**
45+	35.7	**0.15 (0.04–0.57)**
Current marital status		
Never married	52.3	1.00
Currently married	37.5	0.82 (0.42–1.59)
Widowed/separated/ divorced	47.5	0.90 (0.52–1.56)
Highest level of education		
Never attended school	53.8	1.00
Completed 1–4 yrs	56.3	1.22 (0.68–2.17)
Completed 5+ yrs	33.4	**0.54 (0.30–0.97)**
Main source of income		
Skilled manual work	33.3	1.00
Unskilled manual work/ trading	34.4	0.92 (0.38–2.19)
Scavenging (ie, rag-picking)	57.0	1.66 (0.61–4.54)
Crime/begging	50.2	0.86 (0.29–2.55)
No source of income	46.9	1.26 (0.51–3.09)
Other	32.0	0.96 (0.21–4.48)
No. of times injected in past week		
7 or less	23.0	1.00
8–14	37.7	2.29 (0.89–5.90)
15–21	59.5	**4.11 (1.58–10.68)**
22+	57.4	**4.62 (1.72–12.34)**
Duration of injecting (yrs)		
≤5	44.4	1.00
6–10	44.3	0.58 (0.10–3.48)
11–20	53.5	1.39 (0.21–9.40)
21+	42.9	1.24 (0.19–7.99)
Depression symptom severity		
Mild or none	29.7	1.00
Moderate	46.6	**2.62 (1.02–6.72)**
Moderately severe	50.4	2.42 (0.93–6.34)
Severe	59.5	**4.35 (1.57–12.01)**
Anxiety symptoms		
No	43.5	1.00
Yes	49.3	**0.67 (0.45–0.99)**
Suicidal ideation in last 12 months		
No	35.4	1.00
Yes	58.4	**2.06 (1.08–3.93)**

TABLE 3. Multiple Negative Binomial Regression for Number of Needle/Sharing Partners in Past Month (n = 420)

	Mean	Adjusted Incident Rate Ratio (95% CI)
Current age (yrs)		
18–24	3.38	1.00
25–44	1.62	**0.34 (0.19–0.59)**
45+	1.42	**0.42 (0.21–0.84)**
Current marital status		
Never married	2.08	1.00
Currently married	1.25	0.79 (0.50–1.23)
Widowed/separated/ divorced	1.58	0.80 (0.60–1.06)
Highest level of education		
Never attended school	2.05	1.00
Completed 1–4 yrs	2.21	0.97 (0.70–1.35)
Completed 5+ yrs	1.08	**0.59 (0.41–0.83)**
Main source of income		
Skilled manual work	0.91	1.00
Unskilled manual work/ trading	1.11	1.02 (0.50–2.09)
Scavenging (ie, rag-picking)	2.25	1.65 (0.89–3.06)
Crime/begging	1.53	0.85 (0.44–1.64)
No source of income	2.00	1.70 (0.77–3.79)
Other	1.28	0.78 (0.29–2.11)
No. of times injected in past week		
7 or less	0.85	1.00
8–14	1.44	1.91 (0.98–3.74)
15–21	1.88	1.90 (0.90–4.01)
22+	2.67	**3.14 (1.54–6.39)**
Duration of injecting (yrs)		
≤5	1.34	1.00
6–10	1.98	0.73 (0.27–1.99)
11–20	2.00	1.18 (0.43–3.20)
21+	1.51	1.04 (0.42–2.57)
Depression symptom severity		
Mild or none	1.28	1.00
Moderate	1.47	1.48 (0.83–2.64)
Moderately severe	1.91	**1.93 (1.00–3.75)**
Severe	2.42	**2.69 (1.34–5.40)**
Anxiety symptoms		
No	1.75	1.00
Yes	1.77	**0.68 (0.54–0.86)**
Suicidal ideation in last 12 months		
No	1.26	1.00
Yes	2.22	**1.62 (1.16–2.27)**

A 2001 meta-analysis of studies investigating the association between negative affective states and sexual risk behaviors found little evidence of such an association.[13] This analysis would concur with our finding that depression was associated with needle sharing but not sexual behaviors. Depression has long been linked with a reduction in libido and sexual activity[40] that may in some part explain why we found no association between depression and sexual risk behaviors. We did, however, find that suicidal ideation was linked to both needle sharing and sexual behaviors, including less frequent condom use with paid partners and a higher number of sexual partners, which is consistent with research showing that suicidal ideation is associated with a range of health risk behaviors.[41] A previous study among PWID in

TABLE 4. Multiple Binary Logistic Regression for Having Had Unprotected Sex at Last Sex With Regular or Paid Female Partners and Male Partners in Last 6 Months

	Unprotected Sex at Last Sex, Regular Female Partner (n = 195)		Unprotected Sex at Last Sex, Paid Female Partner (n = 133)		Unprotected Sex at Last Sex, Male Partner (n = 157)	
Characteristic	% Unprotected Sex	Adjusted odds ratio (95% CI)	% Unprotected Sex	Adjusted odds ratio (95% CI)	% Unprotected Sex	Adjusted odds ratio (95% CI)
Current age (yrs)						
18–24	68.1	1.00	63.4	1.00	76.7	1.00
25–44	67.1	0.85 (0.13–5.21)	48.4	0.29 (0.07–1.21)	90.5	4.31 (0.70–26.42)
45+	64.6	0.92 (0.13–6.62)	43.0	0.17 (0.03–1.04)	72.0	0.66 (0.10–4.36)
Current marital status						
Never married	62.7	1.00	50.3	1.00	85.6	1.00
Currently married	65.0	1.08 (0.35–3.39)	37.1	0.71 (0.15–3.35)	88.9	1.56 (0.26–9.53)
Widowed/separated/divorced	82.3	2.59 (0.57–11.71)	52.5	1.15 (0.32–4.20)	70.5	**0.34 (0.12–0.94)**
Highest level of education						
Never attended school	67.4	1.00	54.9	1.00	83.7	1.00
Completed 1–4 yrs	67.9	1.08 (0.44–2.61)	35.4	0.34 (0.09–1.24)	83.1	0.68 (0.15–2.97)
Completed 5+ yrs	64.1	0.82 (0.30–2.28)	55.6	0.80 (0.30–2.11)	85.2	0.88 (0.21–3.68)
Main source of income						
Skilled manual work	76.8	1.00	45.1	1.00	81.9	1.00
Unskilled manual work/ trading	56.4	**0.28 (0.09–0.86)**	43.9	1.17 (0.20–6.99)	85.1	2.12 (0.21–21.43)
Scavenging (ie, rag-picking)	69.4	0.49 (0.15–1.63)	52.9	1.19 (0.28–5.08)	83.1	1.01 (0.21–4.77)
Crime/begging	77.3	0.87 (0.24–3.11)	32.8	0.40 (0.09–1.77)	88.9	2.42 (0.33–17.69)
No source of income	37.1%	0.08 (0.01–1.39)	65.5%	0.96 (0.10–9.16)	81.4%	1.18 (0.09–14.78)
Other	0.0	—	0.0	—	80.4	1.92 (0.05–76.83)
Number of female sexual partners in past 6 months		**0.75 (0.60–0.94)**		0.83 (0.62–1.12)		0.99 (0.75–1.31)
Depression symptom severity						
Mild or none	60.7	1.00	52.5	1.00	78.9	1.00
Moderate	73.8	1.55 (0.56–4.29)	48.4	0.86 (0.11–6.81)	80.1	1.81 (0.33–9.93)
Moderately severe	65.9	0.88 (0.24–3.23)	48.0	1.16 (0.13–10.19)	85.0	1.01 (0.17–6.08)
Severe	63.7	0.67 (0.21–2.17)	51.1	1.61 (0.21–12.33)	93.7	3.53 (0.47–26.76)
Anxiety symptoms						
No	70.7	1.00	57.4	1.00	76.0	1.00
Yes	64.4	0.65 (0.28–1.53)	45.5	**0.29 (0.09–0.98)**	88.3	2.65 (0.56–12.61)
Suicidal ideation in last 12 months						
No	59.9	1.00	33.5	1.00	86.5	1.00
Yes	71.9	2.60 (0.96–7.02)	55.3	**4.97 (1.12–22.13)**	82.4	0.63 (0.16–2.44)

Analysis was conducted among a subset of participants who had reported having sex with the different types of partners. The analysis did not extend to noncondom use at last sex with casual nonpaid partners because very few participants reported noncondom use at last sex with such partners.

Delhi found a similar high prevalence of suicidal ideation and reported an association between suicidal ideation and experiences of human rights abuses including discrimination in health care settings such as being denied needles and syringes, being arrested by police, and being physically abused.[26]

An interesting finding in our study is that anxiety, as measured by the GAD-2, was associated with reduced injecting and sexual risk behaviors. The association between anxiety and reduced risk behavior was only revealed once depression was controlled for—the unadjusted results for anxiety were not statistically significant. Once depression is controlled for a protective effect of anxiety is revealed. This is consistent with findings that anxiety is associated with an exaggerated tendency to engage in risk-avoidant/cautious decision making in connection with a heightened perception of the likelihood and severity of negative outcomes and potential threats.[42,43]

Our finding is contrary to that of a previous study among PWID in Puerto Rico, which found that severe anxiety symptoms were associated with increased HIV risk behaviors.[19] However, this study used the Beck Anxiety Inventory (BAI), a tool that has been shown to reflect the severity of depression as well,[44] thus casting doubt over its ability to discriminate between anxiety and depression. This could be problematic given the overlap between depression and anxiety and the abovementioned findings in previous research showing that depression has been linked with greater

TABLE 5. Multiple Negative Binomial Regression for Number of Female Sexual Partners in Past 6 Months (n = 420)

Characteristic	Mean	Adjusted Incident Rate Ratio (95% CI)
Current age (yrs)		
18–24	1.64	1.00
25–44	1.40	0.90 (0.59–1.35)
45+	1.42	0.83 (0.46–1.49)
Current marital status		
Never married	1.52	1.00
Currently married	1.39	0.80 (0.53–1.21)
Widowed/separated/ divorced	1.26	0.81 (0.64–1.01)
Highest level of education		
Never attended school	1.60	1.00
Completed 1–4 yrs	1.59	0.88 (0.58–1.34)
Completed 5+ yrs	1.12	**0.65 (0.50–0.85)**
Main source of income		
Skilled manual work	1.73	1.00
Unskilled manual work/ trading	1.75	0.81 (0.41–1.60)
Scavenging (ie, rag-picking)	1.31	0.55 (0.30–1.01)
Crime/begging	2.01	0.84 (0.41–1.74)
No source of income	0.78	**0.32 (0.16–0.66)**
Other	0.83	0.34 (0.13–0.91)
Depression symptom severity		
Mild or none	1.51	1.00
Moderate	1.31	0.86 (0.54–1.38)
Moderately severe	1.51	0.98 (0.64–1.51)
Severe	1.41	0.88 (0.53–1.47)
Anxiety symptoms		
No	1.67	1.00
Yes	1.33	0.76 (0.58–1.00)*
Suicidal ideation in last 12 months		
No	1.04	1.00
Yes	1.78	**1.82 (1.39–2.41)**

*Borderline statistical significance, $P = 0.053$.

engagement in HIV risk behaviors. Additionally, the BAI may be more likely to detect different aspects of anxiety compared with the GAD-2. For example, it has been found that people with panic disorder score higher on the BAI than patients with generalized anxiety disorder,[45] and the 2 types of anxiety may have a different relationship with health risk behaviors. The results of our study suggest that those researching the impact of anxiety on HIV risk behaviors should ensure that they control for a measure of depression and account for the broad spectrum of anxieties.

We found that symptoms of depression, anxiety, and suicidal ideation each had a distinctive relationship with risky injecting and sexual practices. Studies that look at either depression or anxiety without controlling for the other and those which use generic psychological distress scales such as the K-10 are missing out on a more nuanced understanding of the complex relationships between common mental health problems and health-related behaviors. Our findings encourage researchers to separate out the effects of different mental health problems when examining the relationship between mental health and health-related behaviors.

Finally, another important finding is that a high proportion (37%) of these men had a history of engaging in anal sex with other men and few (16%) used a condom on the last occasion. Men who inject drugs and have sex with men are particularly vulnerable to HIV infection and have the potential to pass the virus across multiple populations. Elsewhere, studies among male PWID and men who have sex with men have identified sizeable subpopulations for whom drug-use risks overlap with male-to-male anal sex.[46–48] Further research is required to investigate the phenomenon of overlapping risks among PWID in Delhi and the context of sex between men in this setting.

Limitations of the Study

There are a number of limitations that should be mentioned. First, as with all cross-sectional study designs, the casual nature of relationships cannot be fully determined. Second, we sampled exclusively from PWID who attend NSPs. However, given that approximately 80% of the PWID population in Delhi attend NSPs, they are a legitimate location from which to recruit a moderately representative sample. It is possible that we may have under-sampled casual users and those newer to injecting and not yet connected to services like NSPs, and their mental health status and HIV risk behaviors may well be different from NSP users; research among PWID from elsewhere in India found an association between NSP use and lower levels of injecting and sexual risk behaviors.[49]

Third, given that we only sampled PWID attending 3 of the 19 NSPs operating in Delhi, there are limits to the generalizability of our findings to the broader population of PWID in Delhi. Future research using time location sampling could build in a larger formative phase to ensure that a higher proportion of NSPs and possibly other venues are included in the sampling frame. Fourth, we excluded PWID who were female or were on OST. Very few PWID accessing NSPs in Delhi are female. PWID participating in OST were excluded from this study given that, elsewhere, OST has been seen to improve the mental health of participants and reduce their engagement in HIV risk behaviors.[15,50] Fifth, symptoms of depression and anxiety were measured using screening tools rather than structured clinical interviews. The proportion of participants who would attract a formal diagnosis is unknown; it is possible that many are experiencing psychological distress related to their socially adverse circumstances and if clinically examined may not satisfy diagnostic criteria for depression or anxiety. The use of structured clinical interviews in future studies would be optimal. Finally, reporting of risky injecting and sexual practices may have been influenced by recall and social desirability bias leading to under-reporting of socially unacceptable behaviors.

To conclude, we found that depression and suicidal ideation are independently positively associated with HIV

risk behaviors, whereas anxiety is associated with a reduction in such behaviors. Despite the limitations of the study, these findings are compelling and have implications for HIV prevention programs. Even more importantly, the mental health problems and socioeconomic marginalization of this group of men are important in and of themselves and should not be eclipsed by a narrow focus on HIV prevention.

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