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► **To cite this version:**

Khue Pham Minh, Roselyne Vallo, Huong Duong Thi, Oanh Khuat Thi Hai, Don Des Jarlais, et al.. Psychiatric Comorbidities among People Who Inject Drugs in Hai Phong, Vietnam: The Need for Screening and Innovative Interventions. *BioMed Research International* , 2018, 2018, pp.8346195. 10.1155/2018/8346195 . hal-01922401

**HAL Id: hal-01922401**

**<https://hal.umontpellier.fr/hal-01922401>**

Submitted on 3 Feb 2020

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## Research Article

# Psychiatric Comorbidities among People Who Inject Drugs in Hai Phong, Vietnam: The Need for Screening and Innovative Interventions

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Received 5 June 2018; Accepted 9 August 2018; Published 4 October 2018

Academic Editor: Roger Ho

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The objective of this study is to describe psychiatric comorbidities, associated factors, and access to psychiatric assessment and care in a cohort of people who inject drugs (PWID) in Hai Phong, Vietnam. Mental health was assessed after 12 months' follow-up using the Mini International Neuropsychiatric Interview questionnaire (MINI 5.0.0). PWID medical history, drug use, and sociodemographic and clinical characteristics were also collected. Among 188 PWID who participated in the assessment, 48 (25.5%) had at least one psychiatric disorder and 19 (10.1%) had 2 or more psychiatric disorders. The most common current psychiatric disorders were major depressive episode (12.2%) and psychotic disorder (4.8%), reaching 10.1% for the latter when lifetime prevalence was considered. Females were more likely than males to have at least one psychiatric disorder, a major depressive disorder, or an anxiety disorder. Methamphetamine use was associated with an increased risk of presenting a lifetime psychotic syndrome. Problematic alcohol consumption was associated with an increased risk of having at least one psychiatric disorder. Psychiatric comorbidities are frequent among PWID in Vietnam. These results highlight the need for routine assessment and innovative interventions to address mental health needs among PWID. Community-based interventions targeting mental health prevention and care should be strongly supported.

## 1. Introduction

People who use drugs are particularly susceptible to mental health disorders [1–3], the most common being mood and anxiety disorders, suicidal ideation, and suicide attempt [2, 4]. Among people who inject drugs (PWID), the prevalence

of mental disorders can reach 40% and increases significantly if the individual has a lifetime prevalence of mental disorders [2]. Determinants of psychiatric disorders among PWID may include social, environmental, psychological, and medical factors and may differ based on the type of substance used. HIV/HCV seropositivity, gender (female), trauma during

childhood, stigma due to drug use, and related conditions and excessive alcohol use are commonly associated with depression. Stimulant use is particularly associated with psychotic syndrome [5–8]. Drug users suffering from mental health disorders are more likely to engage in high-risk behaviors and have negative outcomes for the treatment of HIV infection and substance use disorders [9]. Stimulant use is particularly associated with psychiatric complications, especially with psychotic symptoms [10], but can also be associated with sexual or injection-related risk behavior and delayed access to methadone initiation for opiate dependency [11, 12].

HIV infection is common among PWID, and people suffering from mental health disorders may delay access to antiretroviral treatment (ART) and have poor virologic response to first-line ART, have low adherence to treatment and impaired quality of life [13, 14], and may exhibit increased prevalence of sexual related risk behaviors [15]. Currently, one major recommendation for addressing mental health is to plan a comprehensive, multidisciplinary, integrated approach to treatment, including drug use and mental health assessment and care for at-risk populations, including PWID [9, 16].

The overall prevalence of psychiatric disorders among PWID in Asia is comparable to Western countries [2]. A major concern in Asia, however, is the increasing use of methamphetamine in the most vulnerable populations (PWID, female sex workers, men who have sex with men) which is associated with several HIV risk-related behaviors [17, 18]. In Singapore, the mean annual total cost of managing a depressive patient was as high as \$7,638 USD, in which the indirect costs (81%) dominated the total costs [19]. As in many low-to-middle income countries [16, 20], psychiatric resources are limited in Vietnam, and even with health insurance coverage, access to mental health treatment is generally complex and expensive. Additionally, there are very few therapeutic options [21, 22]. The stigmatization of mental illness thus constitutes a significant barrier for access to care.

Hai Phong is the largest harbor city in North Vietnam with approximately 2 million inhabitants. It has an estimated population of 5,000 PWID [23] with 3,955 patients treated with methadone in March 2017 (Vietnamese Ministry of Health). It has documented a very high prevalence of HIV among PWID, reaching 66% in 2006, decreasing to 48% in 2009 and 30% in 2016. As a result of “combined prevention” programs including increased access to ART, methadone treatment, and harm reduction interventions (mainly information-education-communication, needle/syringe exchange programs, and condoms), the estimated HIV incidence among PWID is now 0.8/100 person-years [24]. There is little information available on the prevalence of mental disorders and access to psychiatric care among PWID and as doctors in methadone and HIV clinics are not allowed to prescribe psychotropic drugs, prescriptions are highly restricted and only dispensed by registered clinical psychiatrists.

In the period of September 2014 to September 2016, the DRIVE-IN study (Drugs and Viral Infections in Vietnam–Initial Phase) was carried out in Hai Phong. The primary objective of the DRIVE-IN project was to evaluate

the feasibility of implementing an interventional cohort of PWID in Hai Phong to demonstrate that the enrolment and follow-up of various hard-to-reach subgroups of PWID were feasible in the local context. The objective of the second phase (the DRIVE project), through a large scale intervention, is to show that we can get close to zero HIV incidence among PWID in Hai Phong. In this study, we present the results carried out at week 64 among DRIVE-IN PWID cohort participants.

## 2. Materials and Methods

**2.1. Study Design.** The current cross-sectional assessment of psychiatric comorbidities was conducted among a sample of PWID included in the DRIVE-IN cohort in Hai Phong, Vietnam [12, 24, 25]. The psychiatric assessment took place during the last visit of the cohort follow-up (the week 64 visit), from March 14 to May 6, 2016.

**2.2. Recruitment of Study Subjects.** Two hundred fifty subjects were included in the DRIVE-IN cohort (for more details, see Michel, Des Jarlais [12]); they were active PWID (verified by skin marks and a positive urine test for opiates or methamphetamine), 18 years of age or older, and capable of giving informed consent. Follow-up was conducted at 19, 32, 52, and 64 weeks; visits took place in a community-based organization (CBO, peer support group) office in Hai Phong City. This psychiatric assessment was systematically offered to all participants of the DRIVE-IN cohort who came to the week 64 visit.

**2.3. Data Collection.** Data was collected using a face-to-face questionnaire covering drug use, psychiatric disorders, and use of services. HIV and HCV testing along with urine testing for drug detection (Nal Von Minden Drug-Screen Urine® rapid test) were conducted during the visit.

The questionnaire was based on instruments previously used by the research team, assessing patterns of drug use, comorbidities, access to MMT and ART, suicide attempt, overdose, and social situation (household registration, medical insurance) with adaptation and pretesting for use in Hai Phong. The drug use questions covered the three months prior to the interview. Hazardous and binge drinking were assessed using the Audit-C questionnaire [26, 27].

**2.4. Psychiatric Assessment.** Current and lifetime psychiatric and substance use disorders were screened for by trained doctors from Hai Phong University of Medicine and Pharmacy using the Mini International Neuropsychiatric Interview (MINI), which is a structured diagnostic psychiatric interview based on the Diagnostic and Statistical Manual of Mental Disorders criteria, 4th Edition (DSM-IV) [28]. This interview recorded information on major depressive episodes, dysthymia, suicidality, (hypo)manic episodes, panic disorder, agoraphobia, social phobia, obsessive-compulsive disorder, post-traumatic stress disorder (PTSD), generalized anxiety disorder (GAD), psychotic disorder, and substance use disorders (i.e., alcohol and drug abuse/dependence).

The MINI questionnaire was translated into Vietnamese following a translation–back translation–pre-test strategy [29–31]. Patients who screened positive for any mental health diagnoses were reported to the psychiatric staff in the Mental Health Department of Hai Phong University of Medicine and Pharmacy, and an appointment was offered with a psychiatrist, first for a clinical assessment in the CBO office where the study took place, and later in the mental health department if a follow-up was necessary. Participants requiring treatment received a free medical prescription from a psychiatrist.

Participants were compensated (150,000 VND–\$750 USD) for their participation in the study and for transportation expenses.

All interviews and data collection were performed by medical staff (doctors and nurses) of Hai Phong University of Medicine and Pharmacy who had been trained by research coordinators (international and national experts from different fields).

**2.5. Data Management and Analysis.** All data was collected on an electronic case report form using ClinCapture® software which complies with the FDA clinical trial recommendations (21 CFR part 11). Analyses were performed using Stata® v10 (Stata Corp, College Station, TX, USA).

For quantitative variables, the means and standard deviations or the median with the interquartile range are presented. For the qualitative variables, frequencies and percentages are presented.

In statistical analysis, mental health problems were divided into four types of psychiatric disorder (nonexclusive): at least one current psychiatric disorder captured by the MINI questionnaire (major depressive episode, dysthymia, etc.), current major depressive disorder, any current anxiety disorder, and lifetime psychotic syndrome.

We analyzed the risk factors for each type of disorder using multivariable logistic regression. Specifically, we first analyzed risk factors in a univariable analysis. The risk factors taken into account included sociodemographic characteristics, comorbidities, and drug and alcohol use. All factors with a  $p < 0.2$  were retained for the multivariable analysis using backward elimination. The goodness of fit was assessed using the Hosmer-Lemeshow test. P-values below 0.05 were considered statistically significant. The model was also tested for multicollinearity by checking the correlation matrix of coefficients of regression and calculating variance inflation factors.

**2.6. Institutional Review Board Approval.** The study was approved by the Institutional Review Boards of the Hai Phong University of Medicine and Pharmacy, Vietnam (No. 05/HDDD), and the Icahn School of Medicine, Mount Sinai, United States (No. MSBI-100-14). All participants signed a written informed consent.

### 3. Results

Among the 250 PWID who gave their consent for a 64-week follow-up, 194 participants came back for a visit during week 64 and 188 agreed to a psychiatric assessment. Their

main characteristics are presented in Table 1. 118 (62.8%) were currently being treated with methadone (*versus* 11 (4.4%) at cohort initiation), 76 (40.4%) self-reported smoking methamphetamine (92 (48.9%) on the basis of self-report and urine test), and 90 were poly drug users (47.9%), the most common being dual heroin and methamphetamine use. Compared to those who participated in the psychiatric assessment, the 62/250 participants who dropped out from the follow-up or refused the psychiatric assessment were not significantly different with respect to age (mean age of 38.3 versus 38.4,  $p=0.452$ ), gender (male: 88.7% versus 87.2%,  $p=0.760$ ), monthly income (mean 4,450,000 versus 4,500,000 VND,  $p=0.153$ ), living in couple (30.7% versus 36.7%,  $p=0.387$ ), or injection years (mean 8,7 versus 8,9,  $p=0.983$ ). Nine PWID died during follow-up, including 2 from overdose and 2 from suicide.

**3.1. Psychiatric Disorders.** Table 2 presents the frequency of psychiatric disorders according to the MINI questionnaire at week 64: 48/188 (25.5%) had at least one current psychiatric disorder and 19 (10.1%) had 2 or more psychiatric disorders. The most common current psychiatric disorders were major depressive episode (12.2%) and psychotic disorder (4.8%), reaching 10.1% for the latter when lifetime prevalence was taken into account. Among female sex workers, 10/21 (47.6%) presented at least one psychiatric disorder, 9/21 (42.9%) a major depressive disorder, and 6/21 (28.6%) at least one anxiety disorder.

**3.2. Clinical Psychiatric Assessment.** The 48 participants who screened positive for a psychiatric disorder, including 14 in a serious clinical situation (high suicide risk and/or psychotic syndrome), were offered a clinical assessment with a psychiatrist at the study site; 39 (81%) agreed and met the psychiatrist (including 12 of the 14 participants in a serious clinical situation) who carried out a full psychiatric diagnosis. Of the 39 who met with the psychiatrist, none of the PWID came back subsequently to the mental health department for hospitalization or an outpatient consultation.

**3.3. Factors Associated with Having a Psychiatric Disorder.** Tables 3–6, respectively, present the results of univariable and multivariable analyses for factors associated with having any psychiatric disorder (Table 3), having a major depressive disorder (Table 4), having any anxiety disorder (Table 5), or having a lifetime psychotic syndrome (Table 6). For each model, independent variables were checked for multicollinearity, of which all variance inflation factors were  $< 5$ .

The various multivariable analyses showed that females were more likely than males to have at least one psychiatric disorder (Adjusted Odds Ratio (AOR): 3.03, 95%CI: 1.02–9.03), a major depressive disorder (AOR[95%CI]: 5.05[1.54–16.60]), or an anxiety disorder (AOR[95%CI]: 3.14[1.04–9.49]). Methamphetamine use was associated with an increased risk of presenting a lifetime psychotic syndrome (AOR[95%CI]: 4.05[1.25–13.15]). Problematic alcohol consumption was associated with an increased risk of having at least one psychiatric disorder (AOR[95%CI]: 2.53[1.19–5.37]).

TABLE 1: Sociodemographic and clinical characteristics among PWID in Hai Phong, Vietnam (N=188).

	N (%)
<b>Sociodemographics</b>	
Gender	
Male	164 (87.2)
Female	24 (12.8)
Age (Mean, SD)	38.4 (8.4)
Living with a partner	
Yes	69 (36.7)
No	119 (63.3)
Any children	
Yes	113 (60.1)
No	75 (39.9)
Monthly income (VND) (Median, IQR)	3,500,000 [3,000,000-5,000,000]
Medical Insurance in Hai Phong	
Yes	159 (84.6)
No	29 (15.4)
Household Registration in Haiphong	
Yes	179 (95.2)
No	9 (4.8)
<b>Drug data</b>	
Urine toxicology	
Benzodiazepine	13 (6.9)
Methamphetamine (“Ice”)	77 (41.0)
Heroin	135 (71.8)
Methadone	120 (63.8)
Drug use (self-report)	
Injected drugs	135 (71.8)
Heroin	135 (100)
Other drugs	0 (0)
Non-injected drugs	
Heroin	16 (8.5)
Methamphetamine (“Ice”)	76 (40.4)
Other	22 (11.7)
Poly drug use (urine test)	90 (47.9)
Methamphetamine (“Ice”) use (self-report and urine test)	92 (48.9)
Number of years of injection (Mean, SD)	8.9 (6.6)
Duration of injection use (N,%)	
Less than 5 years	71 (38.0)
Greater than or equal to 5 years	116 (62.0)
Number of injections in a typical day (last 30 days) (Mean, SD)	1.2 (1.2)
Alcohol use (Audit-C)	
Hazardous use	55 (29.3)
Binge drinking	20 (10.6)
Methadone treatment (self-report)	118 (62.8)
Serology	
HIV positive	36 (19.2)
HCV positive	119 (63.3)
Past history of overdose	34 (18.1)
Past history of suicide attempt	26 (13.8)

TABLE 2: Frequency of psychiatric disorders among PWID in Hai Phong, Vietnam, according to the MINI questionnaire (N=188).

	N (%)	
At least one psychiatric disorder <sup>&amp;</sup>	48 (25.5)	
Number of psychiatric disorders (N=48) <sup>&amp;</sup>		
1	29 (15.4)	
2	10 (5.3)	
3	5 (2.7)	
4	0 (0)	
5	3 (1.6)	
6	1 (0.5)	
Mood disorder <sup>&amp;</sup> (any)	27 (14.4)	
Anxiety disorder <sup>&amp;</sup> (any)	28 (14.9)	
	<b>Current</b>	<b>Lifetime</b>
Major depressive episode	23 (12.2)	9 (4.8)
Dysthymia	5 (2.7)	
Suicidality		
Suicide risk (any level)	36 (19.1)	
Low risk	25 (13.3)	
Moderate risk	5 (2.7)	
High risk	6 (3.2)	
(Hypo)manic episode	8 (4.3)	18 (9.6)
Panic disorder	4 (2.1)	11 (5.9)
Agoraphobia	10 (5.3)	
Social phobia	3 (1.6)	
Obsessive-compulsive disorder	4 (2.1)	
Post-traumatic stress disorder	6 (3.2)	
Generalized anxiety disorder	9 (4.8)	
Psychotic disorder	13 (6.9)	19 (10.1)
Alcohol use disorder		
Abuse	8 (4.3)	
Dependence	3 (1.6)	
Drug use disorder		
Dependence*	148 (78.7)	
Heroin	145 (77.1)	
Methamphetamine ("Ice")	11 (5.9)	
Other**	3 (1.6)	
Abuse*	39 (20.1)	
Heroin	10 (5.3)	
Methamphetamine ("Ice")	29 (15.4)	
Other**	3 (1.6)	

<sup>&</sup>Only current disorders.

\*Subjects can be dependent/abusers with several drugs at the same time.

\*\*Other amphetamines, cannabis, methadone.

#### 4. Discussion

Using the MINI questionnaire, based on the DSM-IV diagnosis criteria, we found that approximately 25% of the PWID had at least one current psychiatric disorder at the time of the study. The rate of psychiatric comorbidities among the participants in our study sample was high, but lower than the prevalence observed in other PWID populations [2] including China [32, 33], Italy [34], the Netherlands [35], and the United States [36]. The current and lifetime depression

rates in our study were comparable to community rates reported by meta-analysis results from 30 countries between 1994 and 2014 [37].

There are several plausible explanations for the results of our study. First, PWID were not recruited among subjects seeking care and thus were more likely to be prone to psychiatric disorders [4, 38]; they were assessed at week 64 and not at cohort initiation, and a large number were receiving methadone treatment that was initiated during follow-up along with support from their CBO-peers, including

TABLE 3: Factors associated with having at least one psychiatric disorder among PWID in Hai Phong, Vietnam (N=188).

Variables	At least one psychiatric disorder N (%)	OR (95% CI)	p value	Adjusted OR (95% CI)	p value
Sex	Male/Trans	36 (22.0)	REF	REF	
	Female	12 (50.0)	3.56 (1.47- 8.59)	<b>0.005</b>	3.03 (1.02-9.03)
Age	≤ 35	21 (27.6)	REF	REF	
	> 35	27 (24.1)	0.83 (0.42- 1.61)	0.587	-
Marital status	Married/partner	18 (26.1)	REF	REF	
	Other	30 (25.2)	0.95 (0.48- 1.88)	0.894	-
Children	No children	17 (22.7)	REF	REF	
	Has Children	31 (27.4)	1.28 (0.65- 2.54)	0.464	-
Monthly income*	≤ 3M VND	19 (20.9)	REF	REF	
	> 3M VND	29 (29.9)	1.61 (0.82- 3.14)	0.158	1.23 (0.59-2.57)
Illness related to HIV (last 3 months)	No	45 (25.0)	REF	REF	
	Yes	3 (37.5)	1.80 (0.41- 7.73)	0.433	-
Past history of overdose	No	37 (24.0)	REF	REF	
	Yes	11 (32.4)	1.51 (0.67- 3.39)	0.316	-
No. of years of injection	≤8 years	24 (23.3)	REF	REF	
	>8 years	23 (27.4)	1.24 (0.64- 2.40)	0.523	-
Urine toxicology: benzodiazepine	No	45 (25.7)	REF	REF	
	Yes	3 (23.1)	0.87 (0.23- 3.29)	0.833	-
Urine toxicology: heroin	No	14 (26.4)	REF	REF	
	Yes	34 (25.2)	0.93 (0.45- 1.93)	0.862	-
Urine toxicology: methadone	No	17 (25.0)	REF	REF	
	Yes	31 (25.8)	1.04 (0.52- 2.07)	0.900	-
Number of injections per month	<75	39 (25.0)	REF	REF	
	≥ 75	9 (28.1)	1.17 (0.50- 2.75)	0.712	-
Problematic alcohol use (Audit-C) <sup>&amp;</sup>	No	29 (21.8)	REF	REF	
	Yes	19 (34.6)	1.89 (0.94- 3.78)	0.071	2.53 (1.19-5.37)
Risk-related sexual practices	No	45 (25.6)	REF	REF	
	Yes	3 (25.0)	0.97 (0.25- 3.74)	0.965	-
Methamphetamine (“Ice”) use <sup>o</sup>	No	19 (19.8)	REF	REF	
	Yes	29 (31.5)	1.86 (0.95- 3.63)	0.067	1.76 (0.87-3.57)
Still on methadone at W64 visit	No	3 (23.1)	REF	REF	
	Yes	29 (24.6)	1.08 (0.27- 4.21)	0.905	-
Currently receiving ART at W64 visit	No	40 (24.4)	REF	REF	
	Yes	8 (33.3)	1.55 (0.62-3.89)	0.351	-
HIV status	Negative	35 (23.0)	REF	REF	
	Positive	13 (36.1)	1.88 (0.86- 4.11)	0.109	1.71 (0.72-4.08)
HCV status	Negative	20 (29.0)	REF	REF	
	Positive	28 (23.5)	0.75 (0.38- 1.47)	0.409	-

\* VND: Vietnam Dong (≤ or > 3 000 000 VND).

<sup>&</sup> Audit-c score ≥3 in women and ≥4 in men.

<sup>o</sup>Self-reported methamphetamine use + urine test.

counseling, harm reduction interventions, support in accessing health insurance, and housing. Second, there was heterogeneity in the methodologies (diagnostic criteria, assessment tools, and population sample selection) used in the literature

to assess the prevalence of psychiatric disorders [8]. In our survey, only Axis I psychiatric disorders on the MINI questionnaire (mood disorders, anxiety disorder, and psychotic syndrome) were taken into account to assess the overall

TABLE 4: Factors associated with having a major depressive disorder (current) among PWID in Hai Phong, Vietnam (N=188).

Variables	Major depressive disorder N (%)	OR (95% CI)	p value	Adjusted OR (95% CI)	p value
Sex	Male/Trans	13 (7.9)	REF	REF	
	Female	10 (41.7)	8.29 (3.08- 22.30)	<0.001	5.05 (1.54-16.60)
Age	≤ 35	12 (15.8)	REF		
	> 35	11 (9.8)	0.58 (0.24- 1.39)	0.224	-
Marital status	Married/partner	7 (10.1)	REF		
	Other	16 (13.5)	1.37 (0.53- 3.53)	0.507	-
Children	No children	9 (12.0)	REF		
	Has Children	14 (12.4)	1.03 (0.42- 2.53)	0.936	-
Monthly income*	≤ 3M VND	9 (9.9)	REF		
	> 3M VND	14 (14.4)	1.53 (0.63- 3.74)	0.345	-
Illness related to HIV (last 3 months)	No	20 (11.1)	REF		
	Yes	3 (37.5)	4.8 (1.06- 21.61)	0.041	1.71 (2.23-12.82)
Past history of overdose	No	17 (17.0)	REF		
	Yes	6 (17.6)	1.72 (0.62- 4.76)	0.292	-
No. of years of injection	≤8 years	11 (10.7)	REF		
	>8 years	11 (13.1)	1.26 (0.51- 3.07)	0.611	-
Urine toxicology: benzodiazepines	No	22 (12.6)	REF		
	Yes	1 (7.7)	0.58 (0.07-4.68)	0.609	-
Urine toxicology: heroin	No	9 (17.0)	REF		
	Yes	14 (10.4)	0.56 (0.23- 1.40)	0.218	-
Urine toxicology: methadone	No	8 (11.7)	REF		
	Yes	15 (12.5)	1.07 (0.43- 2.67)	0.882	-
Number of injections per month	<75	19 (12.2)	REF		
	≥ 75	4 (12.5)	1.03 (0.32- 3.26)	0.960	-
Problematic alcohol use (Audit-C) <sup>⊗</sup>	No	15 (11.3)	REF		
	Yes	8 (14.6)	1.34 (0.53- 3.36)	0.535	-
Methamphetamine (“Ice”) use <sup>◦</sup>	No	12 (12.5)	REF		
	Yes	11 (12.0)	0.95 (0.40-2.27)	0.909	-
Still on methadone at W64 visit	No	3 (23.1)	REF		
	Yes	14 (11.9)	0.45 (0.11- 1.83)	0.264	-
Currently receiving ART at W64 visit	No	20 (12.2)	REF		
	Yes	3 (12.5)	1.03 (0.28-3.76)	0.966	-
HIV status	Negative	16 (10.5)	REF		
	Positive	7 (19.4)	2.05 (0.77- 5.43)	0.148	1.05 (0.29-3.81)
HCV status	Negative	11 (15.9)	REF		
	Positive	12 (10.1)	0.59 (0.24- 1.42)	0.241	-

\* VND: Vietnam Dong (≤ or > 3 000 000 VND).

⊗ Audit-c score ≥3 in women and ≥4 in men.

◦Self-reported methamphetamine use + urine test.

prevalence of psychiatric disorders, which would exclude particular disorders, such as personality disorders.

Given the great burden of mental health problems among PWID populations, and the association between mental health problems, increased risk-related behaviors, and decreased effectiveness in terms of prevention, access to care,

and quality of life, screening and care for mental health pathologies should be integrated into drug use and HIV treatment clinics as part of the regular patient intake process.

Our findings highlight the great need for innovative forms of psychiatric care for PWID in Vietnam, particularly with provision of care in the community, and the need to

TABLE 5: Factors associated with having an anxiety disorder (current) among PWID in Hai Phong, Vietnam (N=188).

Variables	Any anxiety disorder N (%)	OR (95% CI)	p value	Adjusted OR (95% CI)	p value
Sex	Male/Trans	20 (12.2)	REF	REF	
	Female	8 (33.3)	3.6 (1.36- 9.48)	<b>0.009</b>	3.14 (1.04-9.49)
Age	≤ 35	13 (17.1)	REF	REF	
	> 35	15 (13.4)	0.75 (0.33- 1.68)	0.484	-
Marital status	Married/couple	11 (15.9)	REF	REF	
	Other	17 (14.3)	0.88 (0.38- 2.00)	0.759	-
Children	No children	8 (10.7)	REF	REF	
	Has Children	20 (17.7)	1.8 (0.75- 4.33)	0.189	1.56 (0.62-3.95)
Monthly income*	≤ 3M VND	11 (12.1)	REF	REF	
	> 3M VND	17 (17.5)	1.54 (0.68- 3.50)	0.298	-
Illness related to HIV (last 3 months)	No	26 (14.4)	REF	REF	
	Yes	2 (25.0)	1.97 (0.38- 10.31)	0.420	-
No. of years of injection	≤8 years	16 (15.5)	REF	REF	
	>8 years	11 (13.1)	0.81 (0.35- 1.87)	0.637	-
Urine toxicology: benzodiazepines	No	26 (14.9)	REF	REF	
	Yes	2 (15.4)	1.04 (0.21- 4.97)	0.959	-
Urine toxicology: heroin	No	8 (15.1)	REF	REF	
	Yes	20 (14.8)	0.97 (0.40- 2.38)	0.961	-
Urine toxicology: methadone	No	12 (17.7)	REF	REF	
	Yes	16 (13.3)	0.71 (0.31- 1.62)	0.426	-
Number of injections per month	<75	23 (14.7)	REF	REF	
	≥ 75	5 (15.6)	1.07 (0.37- 3.06)	0.899	-
Problematic alcohol use(Audit-C) <sup>§</sup>	No	19 (14.3)	REF	REF	
	Yes	9 (16.4)	1.17 (0.49- 2.78)	0.716	-
Methamphetamine (“Ice”) use <sup>°</sup>	No	9 (9.4)	REF	REF	
	Yes	19 (20.7)	2.51 (1.07- 5.89)	<b>0.034</b>	2.28 (0.94-5.47)
Still on methadone at W64 visit	No	2 (15.4)	REF	REF	
	Yes	16 (13.6)	0.86 (0.17- 4.25)	0.865	-
Currently receiving ART at W64 visit	No	25 (15.2)	REF	REF	
	Yes	3 (12.5)	0.79 (0.22-2.86)	0.724	-
HIV status	Negative	22 (14.5)	REF	REF	
	Positive	6 (16.7)	1.18 (0.44- 3.16)	0.740	-
HCV status	Negative	14 (20.3)	REF	REF	
	Positive	14 (11.8)	0.52 (0.23- 1.17)	0.117	0.48 (0.21-1.12)

\* VND: Vietnam Dong (≤ or > 3 000 000 VND).

§ Audit-c score ≥3 in women and ≥4 in men.

°Self-reported methamphetamine use + urine test.

further examine factors associated with failure to attend services. In addition, the factors associated with presenting a psychiatric disorder in this study highlight the crucial role of methamphetamine and alcohol use, and also the vulnerability of female PWID.

Being female is associated with an increased prevalence of psychiatric disorders, including major depressive disorder and anxiety disorder. A higher prevalence of psychiatric disorders among women compared to men is well documented, particularly for depressive and anxiety disorders [39, 40]. The

fact that 21 of the 24 women in our cohort were sex workers could explain this result, as mental distress is frequently documented among sex workers [41, 42].

Methamphetamine use is associated with lifetime psychotic syndrome. The use of psycho-stimulants is also commonly associated with a substantial burden of psychopathology, which includes elevated rates of psychosis, mood, and anxiety disorders [43, 44]. One of the key clinical differences between psycho-stimulant and opioid use is that psycho-stimulant use can induce psychotic episodes.

TABLE 6: Factors associated with having a psychotic syndrome (lifetime) among PWID in Hai Phong, Vietnam (N=188).

Variables	Psychotic syndrome N (%)	OR (95% CI)	p value	Adjusted OR (95% CI)	p value
Sex	Male/Trans	15 (9.2)	REF		REF
	Female	4 (16.7)	1.98 (0.60-6.58)	0.261	-
Age	≤ 35	11 (14.5)	REF		REF
	> 35	8 (7.1)	0.45 (0.17-1.18)	0.108	0.45 (0.16-1.29)
Marital status	Married/partner	6 (8.7)	REF		REF
	Other	13 (10.9)	1.28 (0.47-3.56)	0.626	-
Children	No children	9 (12.0)	REF		REF
	Has Children	10 (8.9)	0.71 (0.27-1.84)	0.484	-
Monthly income*	≤ 3M VND	10 (11.0)	REF		REF
	> 3M VND	9 (9.3)	0.83 (0.32-2.14)	0.698	-
Illness related to HIV (last 3 months)	No	19 (10.6)	REF		REF
	Yes	0	-	-	-
Past history of overdose	No	16 (10.4)	REF		REF
	Yes	3 (8.8)	0.83 (0.23-3.04)	0.784	-
No. of years of injection	≤8 years	12 (11.7)	REF		REF
	>8 years	7 (8.3)	0.69 (0.26-1.83)	0.457	-
Urine toxicology: benzodiazepines	No	16 (9.1)	REF		REF
	Yes	3 (23.1)	2.98 (0.74-11.9)	0.123	0.10 (0.16-3.91)
Urine toxicology: heroin	No	4 (7.6)	REF		REF
	Yes	15 (11.1)	1.53 (0.48-4.84)	0.72	-
Urine toxicology: methadone	No	9 (13.2)	REF		REF
	Yes	10 (8.3)	0.59 (0.23-1.54)	0.288	-
Number of injections per month	<75	16 (10.3)	REF		REF
	≥ 75	3 (9.4)	0.91 (0.25-3.30)	0.880	-
Problematic alcohol use (Audit-C) <sup>&amp;</sup>	No	13 (9.8)	REF		REF
	Yes	6 (10.9)	1.13 (0.40-3.14)	0.814	-
Methamphetamine (“Ice”) use <sup>o</sup>	No	4 (4.2)	REF		REF
	Yes	15 (16.3)	4.48 (1.42-14.06)	<b>0.008</b>	4.05 (1.25-13.15)
Still on methadone at W64 visit	No	2 (15.4)	REF		REF
	Yes	11 (9.3)	0.56 (0.11-2.88)	0.493	-
Currently receiving ART at W64 visit	No	16 (9.8)	REF		REF
	Yes	3 (12.5)	1.32 (0.36-4.92)	0.677	-
HIV status	Negative	16 (10.5)	REF		REF
	Positive	3 (8.3)	0.77 (0.21-2.81)	0.695	-
HCV status	Negative	11 (15.9)	REF		REF
	Positive	8 (6.7)	0.38 (0.14-0.99)	<b>0.049</b>	0.41 (0.16-0.29)

\* VND: Vietnam Dong (≤ or > 3 000 000 VND).

<sup>&</sup> Audit-c score ≥3 in women and ≥4 in men.

<sup>o</sup>Self-reported methamphetamine use + urine test.

Case-control studies have reported that psycho-stimulant users have higher levels of psychotic disorders than opioid, benzodiazepine, and barbiturate users [45–48]. Methamphetamine use in recent years has increased markedly in Vietnam [12, 17]. However the majority of drug users are not aware of the risks associated with using amphetamine-type stimulants [17, 25]. This is a major concern for the Vietnamese

healthcare and social system for health education, harm reduction, HIV, HCV, and mental health prevention and care in this population of drug users [12, 17, 25].

Problematic alcohol consumption was associated with having at least one psychiatric disorder. Alcohol abuse can cause depression, anxiety, psychosis, and antisocial behavior, both during intoxication and during withdrawal [8, 49, 50].

When alcohol use disorders and psychiatric disorders co-occur, patients are more likely to have difficulty maintaining abstinence, to attempt or commit suicide, and to use health services [51–53]. Thus, the implementation of mental health-care services for PWID should be carried out in conjunction with care for abuse of other substances such as methamphetamine and should include alcohol abuse screening and management. Given the inadequate coverage of general mental health services in the community in Vietnam, in a field where human resources are insufficiently trained [54], a specific training program for health workers in the health care system is urgently needed.

PWID in the study frequently agreed to meet a psychiatrist in community-based premises but were reluctant to go to a psychiatric hospital, even for an outpatient consultation; in fact, none of the PWID came back for treatment at the psychiatric hospital or for an outpatient consultation. This general reluctance indicates a need to develop outreach psychiatric care within the community to reduce stigma associated with seeking mental health services.

There are several implications from this study. First, screening for mental health problems should be routinely implemented, particularly among high-risk populations such as PWID. This is a complex issue in Vietnam, where access to psychiatric care is limited, psychiatric disorders and drug use are stigmatized, and there is a lack of specialized knowledge among professionals in methadone or HIV clinics to handle mental health problems. Routine assessments and dedicated routes of access to care should be organized according to local resources, including integrated care in MMT clinics and CBO support [12, 53, 55]. Recent data has shown the ability of community-based organizations to screen for and identify disorders, maintain contact, and provide harm reduction tools for PWID and to support PWID in accessing methadone treatment, particularly by overcoming administrative barriers [12, 25, 56]. In countries where the scaling-up of health services dedicated to addiction medicine cannot cover the needs of PWID, CBO interventions should be strongly supported, as they can mobilize quickly and reach this population easily.

There are several limitations to this study that should be noted. First, we used a cross-sectional design, and as a result we could not establish temporal relationships across variables. Psychiatric problems can occur before or after the onset of a drug addiction; certainly, this chronological order can have consequences on the approach to treatment. Second, because we used a convenience sample, we cannot generalize our findings to the PWID population as a whole. In addition, our small sample size reduced the statistical power of our study. The association between HIV status and depression, for example, common in the literature [57], could have reached significance with a larger sample size; these findings should therefore be replicated in a larger sample of PWID. Finally, some significant and frequent comorbidities such as attention deficit and hyperactivity disorder [58] or medical complications associated with intravenous drug use such as infective endocarditis [59] and cutaneous complications [60] were not reported in our study, and as a result, we were unable to examine associations with respect to these variables.

## 5. Conclusion

The findings presented in this study confirm that there are frequent psychiatric comorbidities among PWID in Vietnam. Many factors, including gender, methamphetamine use, and problematic alcohol consumption, appear linked to mental health disorders. These results highlight the need for routine assessment and adaptation of the mental health system to address the needs of PWID. CBO interventions should be strongly supported to screen for and identify disorders, maintain contact, and provide access to care by overcoming administrative barriers.

## Abbreviations

ANRS:	French Agence Nationale de Recherches sur le Sida et les hépatites virales
ART:	Antiretroviral treatment
CBO:	Community-based organization (peer support group)
CFR part 11:	Part II of the Code of Federal Regulations of the US FDA on electronic records and electronic signatures
DSM-IV:	Diagnostic and Statistical Manual of Mental Disorders, 4th Edition
FDA:	Food and Drug Administration, United States
GAD:	Generalized anxiety disorder
HIV:	Human immunodeficiency virus
HCV:	Hepatitis C Virus
MINI:	Mini International Neuropsychiatric Interview
MMT:	Methadone maintenance therapy
MSM:	Men having sex with men
PTSD:	Post-traumatic stress disorder
PWID:	People who inject drugs
VND:	Vietnam Dong (Vietnamese Currency)
USD:	US Dollar.

## Data Availability

The EXCEL/STATA data used to support the findings of this study are available from the corresponding author upon request.

## Disclosure

The DRIVE study team was composed of Vu Van Cong, Ted Hammet, Le Minh Giang, Marie Jauffret Roustide, Jean-Pierre Molès, Pham Minh Khue, Roselyne Vallo, Duong Thi Huong, Khuat Thi Hai Oanh, Nguyen Thi Thoa, Doan Thi Thu, Hoang Thi Giang, Nguyen Thanh Hai, Hoang Thi Hoa Le, Nham Thi Tuyet Thanh, Vu Hai Vinh, Marianne Peries, Kamyar Arasteh, Catherine Quillet, Jonathan Feelemyer, Laurent Michel, Don Des Jarlais, Nicolas Nagot, Didier Laureillard, Ha Quang Hiep, Cao Thi Kim Giang, Nguyen Huu Nhan, Vu Minh Son, Dao Nhat Quyen, Nguyen Thi Thu, Nguyen Hoang Long, Nguyen Van Dinh, Nguyen Thi Thanh, Le Thi Loan, Dang Thi Ly. The funding agencies

did not interfere with either the design of the study or the interpretation of the results.

## Conflicts of Interest

The authors have no conflicts of interest to report.

## Acknowledgments

This work was cosupported by the French Agence Nationale de Recherches sur le Sida et les hépatites virales (ANRS) [ANRS 12299] and the US National Institutes of Drug Abuse (NIDA) [NIDA P30DA011041]. Special thanks are due to Dr. Minh Tuan Nguyen (Bach Mai Hospital, Hanoi), Dr. Vi-Huong Nguyen-Michel (Pitié-Salpêtrière Hospital, Paris), Pr Jean-Pierre Lépine (Inserm U 1144, Paris), and Duc Trung Tran and Kieu An Nguyen (SCDI, Hanoi) who participated in the adaptation of the MINI questionnaire in Vietnam.

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