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Short communication

Prevalence of xylazine among people who inject drugs seeking medical care at a syringe services program clinic: Miami, Florida, 2023

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HIGHLIGHTS

- Xylazine was found in over half of all samples in Miami.
- Xylazine was associated with presenting to the clinic with wounds.
- Widespread xylazine testing is urgently needed.

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ABSTRACT

Background: We aimed to report the preliminary xylazine prevalence among people who inject drugs (PWID) treated at a student-run free clinic in Miami, FL, USA and to identify characteristics associated with screening positive for xylazine.
Methods: A retrospective chart review of 59 patients presenting to a syringe services program (SSP) clinic in was conducted between April 27th and August 17th, 2023. We measured presence of xylazine with rapid visual immunoassay strips on patient urine samples.
Results: Xylazine was present in 55.9 % (33/59) of urine samples including 2 without detected opioids. Xylazine presence was significantly associated with unsheltered homelessness ($p = 0.018$), presence of wound(s) ($p = 0.008$), and testing positive for hepatitis C antibody ($p = 0.014$), fentanyl ($p = 0.005$) and MDMA ($p = 0.002$).
Conclusions: A high prevalence of xylazine in the Southeastern United States furthers evidence of the geographical spread of xylazine and rapidly evolving illicit drug supply. Widespread xylazine screening is urgently needed to inform people who inject drugs and to studyinterventions to minimize harms associated with xylazine.

1. Introduction

Xylazine is an alpha-2 adrenergic agonist approved by the Food and Drug Administration (FDA) as a sedative for non-human use in veterinary medicine. Xylazine potentiates respiratory depression by triggering rapid decrease in release of norepinephrine and dopamine in the central nervous system (Sinclair, 2003). Since the early 2000s, xylazine has been detected in the international drug supply, particularly in Puerto Rico (Reyes et al., 2012). In recent years, xylazine, also known as "tranq, " has been increasingly detected in the national street drug supply (Alexander et al., 2022). Use of xylazine is associated with a severe withdrawal syndrome, chronic—and sometimes disfiguring—skin ulceration and wounds, and increased overdose risk (Bishnoi et al., 2023; Ehrman-Dupre et al., 2022). In April 2023, the Biden–Harris Administration designated the xylazine-adulterated fentanyl supply as an emerging threat (The White House, 2023a).

Xylazine prevalence has been reported in the Northeast and Mid-Atlantic regions of the United States with a recent study in Maryland finding a 85.8 % xylazine-positive rate on paraphernalia swab among SSP participants seeking to purchase opioids (Alexander et al., 2022;

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Russell et al., 2023). While xylazine surveillance remains limited, post-mortem data confirms its rapid geographical spread. A recent study on post-mortem overdoses in Florida listed xylazine as the cause of death in 37 % of accidental drug overdose deaths in two South Florida counties between 2015 and 2022 (Potoukian et al., 2023). Widespread rapid xylazine testing could help us to understand the changing drug supply, guide harm reduction interventions, and facilitate treatment of substance use disorder. We sought to determine xylazine prevalence and patient factors associated with screening positive for xylazine at a student-run free clinic which partners with an SSP in Miami, FL. We aimed to inform treatment, prevention, and outreach efforts related to xylazine use in the community.

2. Methods

2.1. Study setting and data collection

We conducted a retrospective chart review of 59 unique participants presenting to an SSP-based medical clinic in Miami, FL between April 27 and August 17, 2023. The Institutional Review Board of the University of Miami approved the study (#20230865) with a waiver of consent. All participants screened for xylazine accessing clinical services as part of standard of care were included in the sample. We excluded the second test result of twelve repeat participants. From April 27, 2023 to July 6, 2023, following the clinical xylazine testing protocol of Korn et al. (2021), only patients who screened positive for fentanyl were screened for xylazine. From July 6, 2023, to August 17, 2023, all patients presenting to clinic were tested for xylazine. Medical students and the SSP's staff collected urine samples from patients for a urine drug screen (UDS) which included lateral flow immunoassay xylazine test strips (XTS) manufactured by BTNX Inc (Pickering, Ontario). The analytical sensitivity of BTNX Inc XTS is 1000 ng/mL. UDS results were recorded in the patient's medical record and used during the clinic encounter to guide clinical practice.

2.2. Measures

We derived demographic data, medical data, and UDS data from medical records. We consulted SSP administrative data for HIV and HCV antibody status results when results were not available in the medical record. The following demographics, clinical presentation and infectious disease status were extracted: age (continuous), biological sex (male, female), gender (man, woman, transgender woman), race/ethnicity (non-Hispanic White, Hispanic, non-Hispanic Black, Other), housing status (apartment/house, unhoused), reason for visit (buprenorphine only, wound care only, wound care + buprenorphine, other), HIV status (positive, negative), HCV antibody status (positive, negative), wound present upon clinical encounter (yes, no) and drugs present on UDS.

2.3. Data analysis

We stratified our data based on xylazine positive versus negative test results to examine associations with variables such as age, sex, gender, race, ethnicity, housing status, reason for visit, HIV status, HCV antibody test result, wound on presentation and other drugs of use regularly screened on the clinic UDS panel. We coded variables, such as housing, to group our qualitative data for statistical analysis. In the "housing status" category, "unhoused" was defined as couch surfing, sleeping unsheltered, living in a car, or living in a shelter. "Housed" was defined as living in a stable house or apartment. Fisher's exact tests were used for variables with smaller sample sizes (i.e., $n < 6$) and chi-squared tests were used for variables with larger sample sizes (i.e., $n > 5$). For continuous variables, T-tests were used to compare means. *P*-values <0.05 were considered significant. All analyses were conducted in STATA Version 16 (College Station, Texas).

3. Results

The study sample included 59 participants presenting to a student-led, weekly free clinic implemented at the SSP (Table 1). Most participants were male (66.1 %) and Non-Hispanic White (57.6 %). Over a third (37.3 %) reported being unhoused. The most common reason for visiting the clinic was for opioid use disorder (OUD) treatment with buprenorphine (53.5 %), followed by wound care (24.1 %). Nearly half of all patients (40.7 %) had a wound present upon physical examination during the clinical encounter, with 75.0 % (18/24) testing positive for xylazine compared to 39.4 % (13/33) in the xylazine negative group. Fentanyl was the most prominent substance detected (81.4 %), and xylazine was detected on UDS in 33 (55.9 %) of all participants.

Compared to those who tested negative, xylazine-positive participants were more likely to be unhoused (72.7 % vs. 42.3 %, $p = 0.018$), HCV antibody positive (66.7 % vs. 34.6 %, $p = 0.014$), positive for fentanyl on UDS (93.9% vs. 65.4%, $p = 0.005$), positive for MDMA on UDS (39.4 % vs. 3.8%, $p = 0.002$), and more likely to have a wound present (54.5 % vs. 23.1 %, $p = 0.008$). There were two participants who tested negative for all opioids but positive for xylazine.

4. Discussion

We documented the presence of xylazine in over half (55.9 %) of participants screened under our clinical testing algorithms. The findings of Korn et al. (2021) suggest this figure may underestimate the true prevalence of xylazine exposure; half of their xylazine-positive samples were detected by mass spectrometry at a value below the sensitivity of immunoassay test strips (<1000 ng/mL). Unsurprisingly, the presence of xylazine was associated with the presence of wounds, a known consequence of xylazine use (Bishnoi et al., 2023), and presence of fentanyl where it is a common adulterant (Russell et al., 2023). Xylazine presence was also associated with HCV antibody positivity, a surrogate of receptive syringe sharing practices which could work synergistically with xylazine to increase risk of development of wounds (Bruneau et al., 2012). The high prevalence of xylazine demonstrates an unstable and adulterated drug supply which compounds structural inequities that place unhoused PWID at even higher risk of poor health outcomes. While an analysis of SSP paraphernalia in Washington, D.C. was the first to report xylazine in the same syringe with cocaine and methamphetamines (Evans et al., 2021), our study is the first to use point-of-care UDS to confirm the presence of xylazine in non-opioid drugs, a potentially catastrophic complication in the current wave of the nationwide overdose crisis.

Simple and immediate drug checking interventions such as point-of-care XTS are essential to harm reduction response, community health efforts, and safer supply initiatives (Wallace et al., 2021). Krotulski et al. (2023) reported that immunoassay XTS manufactured by BTNX Inc. used in this study are acceptable for drug checking due to their high sensitivity (100 %) and specificity (85 %), However, it is important to acknowledge the limitations of point-of-care test strips. Immunoassay drug checking is susceptible to (1) false-positive results due to cross-reactivity of the test strip antibody and (2) misinterpretation due to limited information provided by the test (Reisfeild et al., 2009; Saitman et al., 2014). In clinical settings, providers must appreciate the complexity of interpreting point-of-care urine drug screens which involves knowledge of drug metabolism, recent prescriptions, and over the counter and supplement regiment (Saitman et al., 2014). Accessible, reliable, and informative testing point-of-care testing is needed to realize the impact of drug checking on the individual, community, and policy levels.

Our major limitation was the 2 different screening protocols included in this analysis. From April 27, 2023 to July 6, 2023, due to limited supply of XTS and prior research utilizing an algorithm testing for xylazine once fentanyl was confirmed (Korn et al., 2021), we used a judgmental sample. Thereafter until August 17, 2023, with greater

Table 1
Patient characteristics and Urine Drug Screen (UDS) results stratified by Xylazine Presence, Miami, Florida 2023.

Variable	Total (*n* = 59)	Xylazine + (*n* = 33)	Xylazine – (*n* = 26)	*p*-value
Age (mean, IQR)	42.5 (11)	42.2 (10)	42.9 (15)	0.597
Sex				0.652
Male	39 (66.1 %)	21 (63.6 %)	18 (69.2 %)	
Female	20 (33.9 %)	12 (36.4 %)	8 (30.8 %)	
Gender				0.573*
Man	38 (64.4 %)	21 (63.6 %)	17 (65.4 %)	
Woman	20 (33.9 %)	12 (36.4 %)	8 (30.8 %)	
Transgender Woman	1 (1.7 %)	0 (0 %)	1 (3.8 %)	
Race/Ethnicity				0.092*
Non-Hispanic White	34 (57.6 %)	23 (69.7 %)	11 (42.3 %)	
Hispanic	22 (37.3 %)	9 (29.3 %)	13 (50.0 %)	
Non-Hispanic Black	3 (5.1 %)	1 (3.0 %)	2 (7.7 %)	
Other	0 (0 %)	0 (0 %)	0 (0 %)	
Housing status				**0.018**
Apartment/House	24 (40.7 %)	9 (27.3 %)	15 (57.7 %)	
Unhoused	35 (59.3 %)	24 (72.3 %)	11 (42.3 %)	
Reason for visit				0.536*
Buprenorphine only	39 (66.1 %)	19 (57.6 %)	20 (76.9 %)	
Wound care only	14 (23.7 %)	9 (27.3 %)	5 (19.2 %)	
Wound care+ Buprenorphine	2 (3.4 %)	2 (100 %)	0 (0 %)	
Other	3 (5.2 %)	2 (6.1 %)	1 (3.8 %)	
HIV status				1.00*
Positive	5 (8.5 %)	3 (9.1 %)	2 (7.7 %)	
Negative	54 (91.5 %)	30 (90.9 %)	24 (92.3 %)	
HCV antibody status				**0.014**
Positive	31 (52.5 %)	22 (66.7 %)	9 (34.6 %)	
Negative	29 (47.5 %)	11 (33.3 %)	17 (65.4 %)	
Wounds present				
Yes	24 (40.7 %)	18 (54.5 %)	6 (23.1 %)	**0.008**
No	33 (55.9 %)	13 (39.4 %)	20 (76.9 %)	
Drugs present on UDS				
Fentanyl	41 (81.4 %)	31 (93.9 %)	17 (65.4 %)	**0.005**
Cocaine	29 (49.2 %)	16 (48.5 %)	13 (50.0 %)	0.908
Cannabis	26 (44.1 %)	14 (42.4 %)	12 (46.2 %)	0.775
Amphetamine	6 (10.2 %)	5 (15.2 %)	1 (3.8 %)	0.215*
Buprenorphine	8 (13.6 %)	3 (9.1 %)	5 (19.2 %)	0.284*
Benzodiazepines	17 (28.8 %)	10 (30.3 %)	7 (26.9 %)	0.776
MDMA	14 (23.7 %)	13 (39.4 %)	1 (3.8 %)	**0.002***
Oxycodone	2 (3.4 %)	2 (6.1 %)	0	0.499*
Tramadol	1 (1.7 %)	1 (3.0 %)	0	1.000*
Ethyl Glucuronide	11 (18.6 %)	5 (15.2 %)	6 (23.1 %)	0.438
Opiates 300[a]	6 (10.2 %)	4 (12.1 %)	2 (7.7 %)	0.685*
Opiates 2000[b]	2 (3.4 %)	1 (3.0 %)	1 (3.8 %)	1.000*
Methadone	5 (8.5 %)	2 (6.1 %)	3 (11.5 %)	0.386*
Methamphetamines	8 (13.6 %)	7 (21.2 %)	1 (3.8 %)	0.067
Opioids detected in UDS				
No	8 (13.6 %)	2 (6.1 %)	6 (23.1 %)	0.058

[a]opiates detected at a cutoff concentration of 300 mg/dL.
[b]opiates detected at a cutoff concentration of 2000 mg/dL.

commercial availability of XTS, we used a convenience sample in which everyone presenting to clinic received a test for the presence of xylazine. Nonetheless, the high prevalence of xylazine in our sample underscores its significant penetration into the drug supply in Miami and need for expanded access to XTS to better inform harm reduction counselling in the xylazine era.

5. Conclusions

These findings provide the first clinical data on xylazine in Florida in living individuals and provides further evidence of increasing xylazine prevalence nationwide. This study is also the first to our knowledge to report the prevalence of xylazine using rapid test strips. The White House's Fentanyl Adulterated or Associated with Xylazine Response Plan prioritizes deployment of point-of-care xylazine testing in clinical settings (The White House, 2023b), but implementation has not been studied in the context of widespread state statutes that are unable to keep pace with the evolving overdose crisis and prohibit drug checking as paraphernalia (Polsky et al., 2023). The >50 % prevalence of xylazine among participants at our SSP underscores the need for an emergent local threat response plan which encompasses xylazine testing in clinical and community settings throughout the state of Florida and beyond, education of PWID regarding xylazine, and development of xylazine informed guidelines for first responders and other service providers. Local substance use treatment programs must be prepared to care for xylazine-associated wounds and withdrawal symptoms. A coordinated response among federal, state, and local officials is emergently needed to address this growing public health threat facing our nation.

CRediT authorship contribution statement

Maia H. Hauschild: Conceptualization, Data curation, Project administration, Writing – original draft. **Peyton V. Warp:** Conceptualization, Data curation, Project administration, Writing – original draft. **Hansel E. Tookes:** Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Resources, Supervision, Writing – original draft, Writing – review & editing. **Ella Yakir:** Project administration, Writing – review & editing. **Bharat Malhotra:** Project administration, Writing – review & editing. **Subul Malik:** Project administration, Writing – review & editing. **Cyrus Owens:** Project administration, Writing – review & editing. **Edward Suarez:** Project administration, Writing – review & editing. **David P. Serota:** Conceptualization, Project administration, Supervision, Writing – review & editing. **Tyler S. Bartholomew:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

None.

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