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Case Series

Ketamine Therapy for Chronic Pain Provides Added Benefits for Substance Misuse Therapy

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Abstract

Background: Chronic pain is complicated by comorbid substance misuse. This multifaceted problem increases the risks of polypharmacy, overdose, impaired driving, and avoidable emergency care.

Methods: This is an observational study of a convenience sample of twenty adult chronic pain patients who underwent regular monthly intramuscular ketamine for multimodal pain therapy. Ketamine was administered at 0.25 mg/kg per treatment session. Each treatment also involved lidocaine plus magnesium nerve blocks. The cohort was profiled by gender and substance misuse category (benzodiazepine, cocaine, kratom, opioid). Numeric pain score, Severity of Dependence Scale (SDS), and PHQ-9 scores were analyzed.

Results: Females comprised 55% (11/20) and males 45% (9/20). Opioids were the most frequent misuse category (45%; 9/20), followed by benzodiazepines (25%; 5/20), cocaine (20%; 4/20), and kratom (10%; 2/20). After repeated treatments, substance misuse improved in all patients, with concordant improvements in mood, pain, and dependence severity. PHQ-9 improved from moderately severe to mild mood disorder, pain improved from severe to moderate, and SDS improved to satisfactory levels.

Conclusion: These outcomes indicate that ketamine-based chronic pain therapy is a potential system for integrated substance-misuse therapy within value-based healthcare, highlighting measurable outcomes, risk mitigation, and public safety. Future studies should include larger prospective studies and collaboration with clinical pharmacists and public safety professionals.

Keywords: *Ketamine; Substance Misuse; Kratom; Value-Based Healthcare; Risk Management; Public Safety*

Introduction

Chronic pain is associated with disability, polypharmacy, and psychological problems [1]. Substance misuse usually co-occurs with chronic pain through biopsychosocial pathways such as undertreated pain, maladaptive coping, and psychiatric comorbidity [2]. Patients with concurrent pain and substance misuse have higher risks of medication interactions, accidental overdose, workplace impairment, impaired driving, and avoidable emergency services utilization. Medication non-compliance is common in patients with chronic disorders [3]. Indeed, this problem undermines outcomes in chronic pain patients [4].

Ketamine is an N-methyl-D-aspartate (NMDA) receptor antagonist medication with downstream glutamatergic and neuroplastic effects [5]. It has established roles in procedural sedation, anesthesia, and acute pain management [6,7]. It has an evolving usefulness in chronic pain management, especially for refractory and neuropathic pain [8]. It has rapid antidepressant effects and influences learning and neuroplasticity relevant to substance craving and relapse [9]. Ketamine has potential benefits for specific substance use disorders, especially when paired with structured psychological therapy [10]. It may support abstinence and improve engagement with behavioural change.

This case series provides a descriptive snapshot of a real-world chronic pain patient cohort receiving regular intramuscular ketamine therapy, who also had documented comorbid substance misuse. The goals of the case study are to characterize the cohort by sex and primary substance misuse category, and to specify a practical value-based care framework for future outcomes measurement in integrated pain and substance dependence care.

Methods

This prospective observational clinical study was registered on ClinicalTrials.gov under the registration number NCT05985811. The healthcare institution approved it as a quality assurance study of routine healthcare that does not require formal ethics review. This is a descriptive case series from an outpatient clinic specializing in the management of chronic pain.

The dataset contains distributional information and patient-level longitudinal outcomes. All the patients provided informed consent. The data collection included patients' gender, diagnosis, and pain clinic therapy. The prospective data collection approach mitigated the risk of outcome or information recall bias. The cohort and longitudinal methods facilitated data collection on multiple variables and outcomes over specific time periods, thereby potentially highlighting new associations. The data are analyzed, compared, and interpreted appropriately. The data are presented as categories, numbers, figures, and tables. The table and figures were created using Microsoft Office tools.

Case Presentation

We studied twenty consecutive adult patients who underwent regular interventional injection therapy at a specialist pain management clinic in Canada from January 2022 to December 2023. We analyzed routine clinical care and treatment outcomes. The consecutive sampling approach minimized the risk of patient selection bias. The convenience sampling comprised all patients who received pain clinic treatment and provided consent for the study. All the patients were provided multimodal value-based therapy for chronic pain, drug dependence, and substance misuse.

Twenty adult chronic pain patients with proven chronic pain and substance misuse received monthly intramuscular ketamine therapy. Monthly intramuscular ketamine was administered under standard monitoring before, during, and after injection. Each patient received intramuscular ketamine 0.25 mg/kg at every treatment session. Their treatment also included lidocaine plus magnesium nerve block injections.

The dataset included gender (male/female) and substance misuse category (benzodiazepine, cocaine, kratom, opioid). Data collection included longitudinal patient outcomes, including Patient Health Questionnaire-9 (PHQ-9) mood scores, numerical pain scores, and Severity of Dependence Scale (SDS) scores. The PHQ-9 mood score ranges from 0 to 27, where 0-4 indicates minimal/no mood disorder, 5-9 is mild, 10-14 is moderate, 15-19 is moderately severe, and 20-27 is severe mood disorder.

The numerical pain score ranges from 0 to 10, where 0 indicates no pain, 1-3 indicates mild pain, 4-6 indicates moderate pain, and 7-10 indicates severe pain. The SDS scores range from 0 to 15, with ≤ 6 considered satisfactory and ≥ 7 unsatisfactory. We collected data immediately before each injection session and 2 weeks after the injection.

The data analysis focused on counts and proportions. We computed descriptive statistics (counts and percentages) overall and by category. We prepared graphical summaries to visualize distributions (overall gender distribution, overall category composition, and category-by-gender comparisons).

Results

The table and figures were created using Microsoft Office tools. The table and figures are original and not reproduced from any publication.

The case series included twenty chronic pain patients with chronic pain and substance misuse who underwent monthly intramuscular ketamine therapy (Table 1).

Table 1. Patients undergoing monthly intramuscular ketamine therapy, total=20 patients.

Substance Misuse	Gender	Population	M: F ratio
Benzodiazepine	Male	2	2:3
	Female	3	
Cocaine	Male	2	1:1
	Female	2	
Kratom	Male	2	2:0
	Female	0	
Opioid	Male	3	1:2
	Female	6	
Total	Male	9	0.8:1
	Female	11	

The cohort consisted of 9 males (45%) and 11 females (55%) (Figure 1). Opioids were the most common primary misuse category (n=9; 45%), followed by benzodiazepines (n=5; 25%), cocaine (n=4; 20%), and kratom (n=2; 10%) (Figure 2).

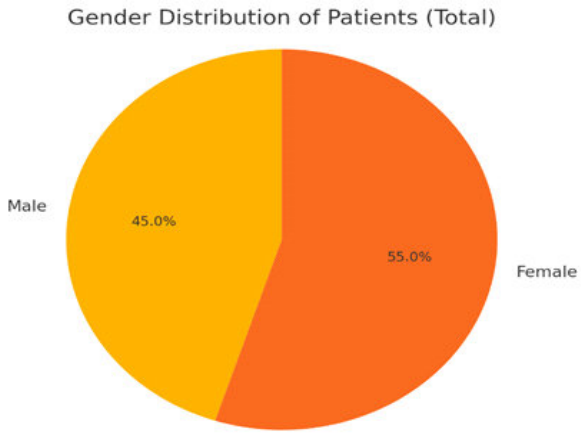

Figure 1. Overall, Gender Distribution of Patients.

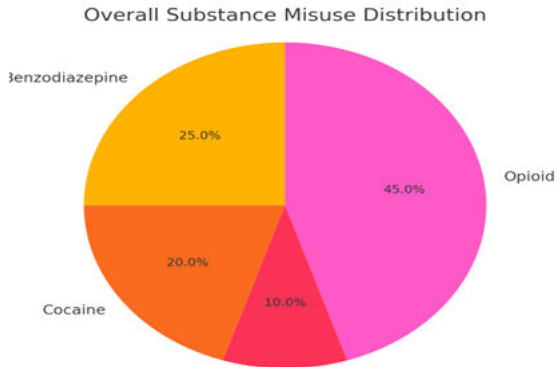

Figure 2. Overall Substance Misuse Distribution.

Within categories, female patients predominated in opioid misuse (6 females vs three males; M: F 1:2). Benzodiazepine misuse was also more common among females (3 vs 2; M: F 2:3). Cocaine misuse was evenly distributed (2 vs 2; M: F 1:1). Kratom misuse occurred only among males in this cohort (2 vs 0; M: F 2:0) as shown in Table 1.

Figure 3 shows bar charts depicting substance misuse by gender. Figure 4 (pie chart) and Figure 5 (stacked bar chart) describe different substance misuse by gender. Figure 6 demonstrates the heatmap of substance misuse by gender.

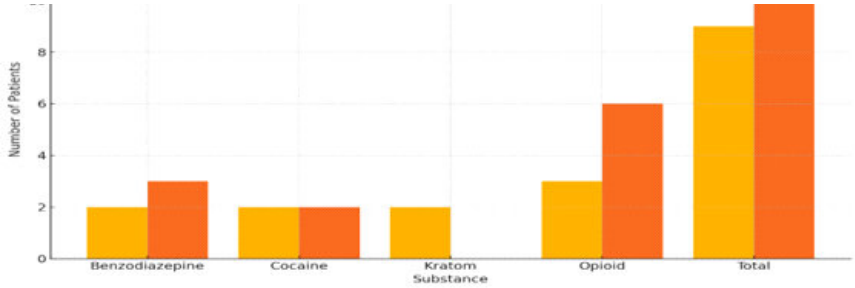

Figure 3. Substance Misuse by Gender (Bar Chart).

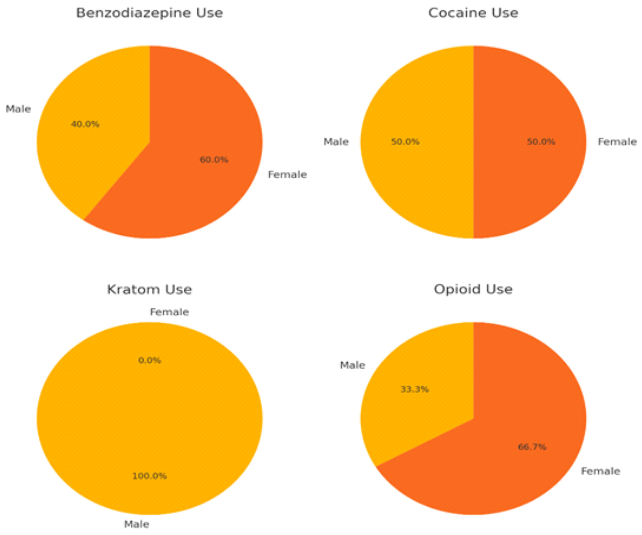

Figure 4. Substance Misuse by Gender (Pie Chart).

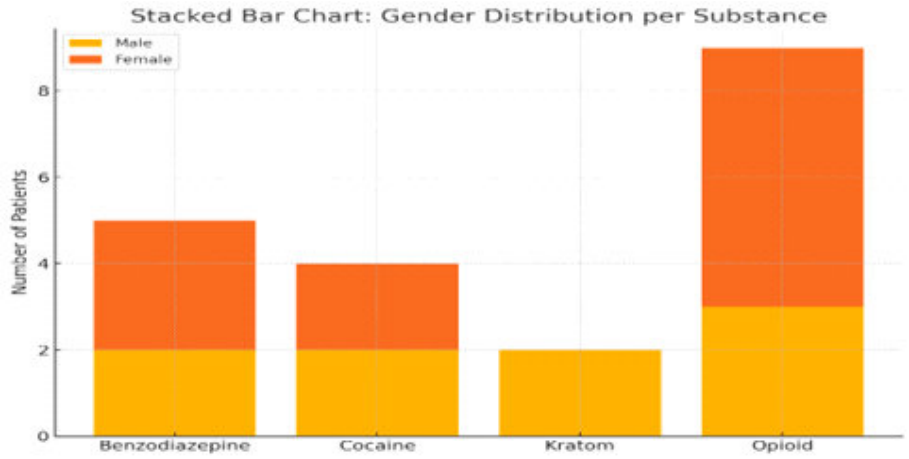

Figure 5. Substance Misuse by Gender (Stacked Bar Chart).

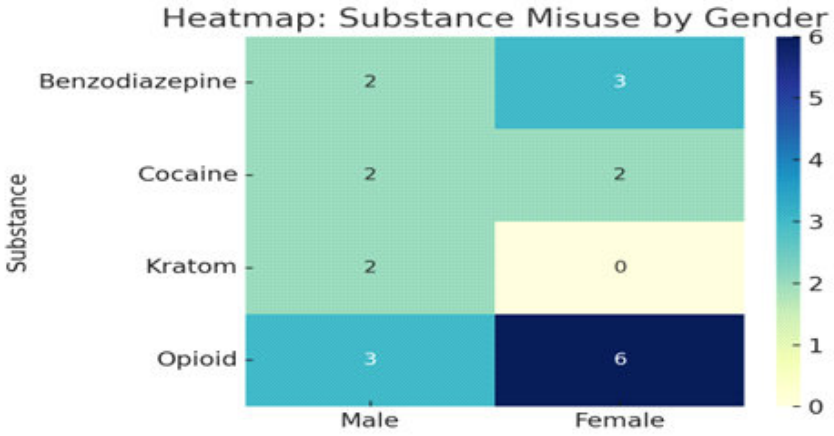

Figure 6. Substance Misuse by Gender (Heatmap).

Substance misuse was reduced in all the patients after each ketamine therapy, as evident by the longitudinal outcomes. Across the patients' mood, pain, and dependence metrics, the pattern indicates consistent improvement with progress from higher-severity categories to lower-severity (or satisfactory) ranges after ketamine therapy. The PHQ-9 scores improved from moderately severe depression (15-19) to mild symptoms (5-9), reflecting substantial mood stabilization. The pain score improved from severe pain (7-10) to moderate pain (4-6), indicating a clinically meaningful reduction in pain intensity. The SDS score improved from the unsatisfactory range (≥7) to 5 (satisfactory, ≤6), suggesting reduced dependence severity.

Discussion

This observational study describes a cohort of twenty chronic pain patients with proven substance misuse who underwent monthly intramuscular ketamine. Opioids (45%) and benzodiazepines (25%) accounted for most substance misuse categories, followed by cocaine (20%) and kratom (10%). Females predominated in the opioid subgroup (6 of 9), while kratom misuse occurred only among males (2 of 2).

The study's clinical interpretation and hypothesis of benefit indicate that substance misuse improved in all patients during ketamine therapy, as evidenced by longitudinal outcomes (mood, pain, dependence scores). Therefore, the cohort profile supports the clinically plausible hypothesis that ketamine-based pain treatment provides an additional opportunity to address substance misuse simultaneously. This is especially beneficial when undertreated pain, depression, post-traumatic stress disorder, or maladaptive coping drives substance misuse. Ketamine's NMDA antagonism and downstream neuroplastic effects reduce central sensitization in many pain phenotypes. They may also attenuate cue reactivity and negative affect that contribute to relapse in substance use disorders.

The current study highlights the importance of public safety management. At the population level, reductions in high-risk substance use patterns can translate to fewer overdose events, fewer impaired driving incidents, and less diversion into the community. For chronic pain clinics, public safety stewardship includes safe prescribing, coordination with primary care and addiction services, and clear protocols for intoxication risk, transportation after treatment, and follow-up. If ketamine-based programs help stabilize both pain and substance misuse, they may indirectly reduce demand on emergency services and law enforcement.

This case study illustrates the implications of value-based healthcare (VBHC). Under VBHC, high-value interventions are those that improve outcomes that matter to patients (function, quality of life, recovery stability) per unit cost. In co-morbid pain-addiction cases, costs often accrue through repeated emergency visits, hospitalization for overdoses or withdrawal complications, and escalation of high-risk polypharmacy. An integrated ketamine pathway could create value if it demonstrably reduces (1) pain interference and disability, (2) craving and relapse frequency, (3) high-risk prescribing and medication burden, and (4) acute-care utilization. For payers and health systems, the relevant VBHC endpoints include avoidable emergency visits, inpatient days, opioid/benzodiazepine exposure, and patient-reported outcome measures.

The current study highlights the importance of personal risk management. From an individual risk lens, comorbid substance misuse increases risks of overdose, falls and fractures (notably with sedatives), impaired driving, medication diversion, and occupational impairment. A structured and monitored therapy model, including careful dose protocols, screening for substance use severity, adverse-event tracking, vitals monitoring, and addiction counselling, can mitigate iatrogenic risk while enabling clinical benefits. Clinically, risk stratification must include mental health screening, monitoring for misuse potential, and assessment of polysubstance use.

This study has a few limitations. The small sample size limits it. Thus, it should be interpreted as a descriptive cohort profile that motivates the evaluation of prospective outcomes rather than definitive evidence of efficacy. Future studies must pair ketamine administration with standardized measures in larger cohorts to further explore its effects. A registry approach may support VBHC contracting by enabling real-world metrics of outcomes and cost offsets. Furthermore, VBHC should involve multidisciplinary teams, including clinical pharmacists and patient advocates.

Conclusion

This cohort study summarizes the substance misuse pattern of twenty chronic pain patients who underwent monthly intramuscular ketamine therapy. Opioid misuse was most prevalent, with notable gender differences across categories. Substance misuse improved in all the patients during the ketamine therapy, which underscores the clinical relevance of integrated pain-addiction care models. Embedding ketamine therapy within VBHC pathways, supported by risk mitigation and public safety protocols, may improve treatment outcomes and reduce avoidable healthcare utilization. Larger prospective clinical studies and structured registries are recommended.

List of Abbreviations

NMDA = N-methyl-D-aspartate

PHQ-9 = Patient Health Questionnaire-9

SDS = Severity of Dependence Scale

VBHC = Value-based healthcare

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgement

All authors attest that all persons designated as authors qualify for authorship and that the article has been checked for plagiarism. All the authors were involved in writing initial and final drafts, proofreading, critical review, and approval of the final article draft.

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