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Length of hospital admission, cannabis use and associated factors in patients with bipolar disorder

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Background: Psychiatric care is increasingly shifting towards de-institutionalisation and outpatient treatment, resulting in a reduction in the length of hospital admission (LOA) for patients with serious mental illness (SMI). Understanding the factors influencing LOA in patients with bipolar disorder (BD) is important for managing associated healthcare costs.

Aim: The study aims to determine socio-demographic and clinical characteristics of patients with BD and to determine whether cannabis use affected LOA.

Setting: Chris Hani Baragwanath Academic Hospital, South Africa.

Methods: A retrospective record review of the patients admitted with BD between 01 July 2022 and 30 June 2023 was conducted.

Results: The median LOA was 23 days. No significant associations were found between clinical characteristics, socio-demographic factors and LOA. Over one-third of the patients used cannabis. However, there was no association between cannabis use and LOA.

Conclusion: The LOA in patients with BD was similar to that of patients with SMI in general, as reported within sub-Saharan African literature. The lack of an association between socio-demographic or clinical characteristics and LOA in the patients with BD supports existing South African literature findings. Cannabis use among patients with BD was lower than that reported in patients with SMI in South Africa. No clear association was found between cannabis use and LOA.

Contribution: Preliminary data suggested an increase in cannabis use post-decriminalisation in South Africa. While there are concerns about the impact of cannabis use on the healthcare system should cannabis use increase, this study found no evidence that cannabis use increases LOA in patients with BD.

Keywords: bipolar disorder; cannabis use; length of hospital admission; South Africa; serious mental Illness.

Introduction

Psychiatric care is shifting from institutionalisation to outpatient care and day treatment services.[1] This shift was driven by multiple factors, including the increasing cost of hospital admissions, the introduction of effective psychiatric medications and growing public awareness of human rights violations faced by individuals with bipolar disorder (BD), schizophrenia and other psychiatric illnesses collectively known as serious mental illness (SMI).[1,2]

In this context, understanding the factors that influence the length of hospital admission (LOA) for psychiatric inpatients is important. Long LOA is associated with substantial clinical, psychosocial and economic burdens, especially in resource-limited settings, such as South Africa.[1,3] Length of hospital admission directly influences healthcare costs, making it an important consideration in financial planning for psychiatric services.

Research findings on the ideal LOA for patients with SMI are inconsistent. Some studies have found that shorter admissions have similar relapse and readmission rates to longer admissions, while others have suggested that shorter admissions have a negative impact on these outcomes.[4,5] The average LOA for patients admitted to psychiatric wards differs by country. In high-income nations, the typical duration of hospitalisation in acute psychiatric settings ranges from 10 days to 43 days.[6,7] South African statistics indicate a longer LOA in designated psychiatric hospitals, averaging 219 days, compared to 11 days in general hospitals and 7 days in district hospitals.[8] Factors associated with longer LOA included older age, being female, being unmarried, involuntary admission,

psychosis, unemployment, homelessness and residence in areas lacking community psychiatric services.[9,10,11]

While existing data have focused on the LOA in patients with SMI, with particular emphasis on schizophrenia,[11] limited data exist on the LOA in patients with BD in South Africa. Bipolar disorder is a mood disorder that affects 44 million people worldwide and was ranked among the top 10 chronic conditions in South Africa in 2016.[12,13] Hospital admission is often required for acute manic and severe depressive episodes.[13] The duration of hospitalisation for individuals with BD is influenced by factors such as the course of the illness, response to pharmacological treatment and the presence of comorbid psychiatric conditions such as substance use disorders and medical conditions such as human immunodeficiency virus (HIV).[14,15]

According to the World Health Organization (WHO), South Africa has a high prevalence of HIV, with an estimated 3.9 million people living with HIV in 2023.[16] People living with HIV may experience worse mood swings owing to medication side effects, neuroinflammation or opportunistic infections.[17] Substance use, particularly alcohol, stimulants and cannabis use, is prevalent among patients with BD and is also associated with higher relapse rates and reduced efficacy of mood stabilisers.[18,19] Substance use is associated with shorter duration of admission in patients with BD.[19] It is possible that this shorter admission may be because of intoxication, with symptoms resolving when the substance wears off.

In September 2018, the South African Constitutional Court decriminalised the private use and cultivation of cannabis by adults, which may have led to an increase in cannabis use.[20,21,22,23] Mona et al.'s study in KwaZulu-Natal found that up to 50% of patients admitted with SMI reported cannabis use.[24] Understanding how cannabis use post-decriminalisation affects LOA in patients with BD is important for mental health planning. If cannabis use extends the LOA, this could lead to increased healthcare costs, necessitating targeted interventions. However, if the LOA is reduced but the risk of relapse increases, different adaptations will be necessary.

Given the limited data on LOA among South African patients with BD, this study aimed to determine the factors associated with hospital stay duration, focusing on those who use cannabis. Understanding these relationships could inform resource allocation, intervention strategies and policies in mental health services.

Aims and objectives

The study aims to investigate the socio-demographic and clinical characteristics of patients diagnosed with BD and to examine the relationship between cannabis use and LOA.

The study objectives were to: (1) describe the socio-demographic and clinical profile of patients admitted with BD, (2) determine the number of patients with BD using cannabis, and (3) determine if an association between LOA and cannabis use or other socio-demographic and clinical characteristics exists.

Research methods and design

Study design

This was a retrospective record review of all adult patients diagnosed with BD who were admitted to Chris Hani Baragwanath Academic Hospital (CHBAH), South Africa, between 01 July 2022 and 30 June 2023.

Study setting

The study was conducted at CHBAH psychiatry department in Soweto, South Africa. The department operates with two female patients' wards and three male patients' wards and receives an average of 155 admissions per month.

Study population

All adult male and female patients who were admitted to CHBAH during the study period and who had a diagnosis of BD were included. Diagnosis was obtained from patient records, and BD was diagnosed and recorded by the treating doctor according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). Only BD was included. Substance-induced bipolar and related disorders and BDs because of another medical condition were not included.

Data collection

Data were collected by reviewing the clinical records of all patients 18 years and older admitted to CHBAH with a diagnosis of BD during the study period. Demographic information included: age, gender, relationship status and employment status. Clinical information included: psychiatric comorbidities, medical comorbidities and a history of substance use (cannabis, crystal methamphetamine, alcohol, heroin and nicotine). Psychiatric comorbidities excluded substance use disorders. Alcohol was included in the substance category, not as a separate variable.

Six patients were admitted but were later transferred to a long-term psychiatric facility. They were excluded from the study because tracking LOA at these facilities was not feasible, as ethics clearance was only obtained for data collection related to CHBAH records. All participants were diagnosed with bipolar I disorder: male patients were four in number and female patients were two. They were transferred to long-stay facilities. Substance use was defined as the ingestion, inhalation or injection of any substance (legal or illicit) within 30 days before the admission. Substance use could be based on history from the patient or family, or as defined by a positive multi-drug urine test (MDUT) result. The MDUT was a bedside-administered qualitative lateral flow immunochromatographic urinary assay multi-drug five-panel test for cocaine, methamphetamine, amphetamine, cannabis and opioid detection. Length of hospital admission was defined as the number of days between admission and discharge.

Data analysis

The data were analysed using STATA, version 18. For socio-demographic and clinical characteristics, categorical data were summarised using frequencies and percentages. For continuous variables, such as age, that were not normally distributed, the median and interquartile ranges (IQR) were used to describe the data. All repeat admissions were recorded under a specific patient identification number, but analysed as separate admissions to avoid skewing results. The LOA for BD at CHBAH during the study period was summarised using the median (IQR).

The proportion of BD admissions with cannabis use before admission *versus* those who had no cannabis use before the current admission was described using frequencies and percentages. Linear regression determined the associations between LOA, cannabis use and other socio-demographic factors. The regression coefficient, 95% confidence interval (CI) and *p*-values were reported. Significance was set at 5%.

Ethical considerations

Permission to conduct research was obtained from CHBAH, and ethical clearance was obtained from the University of Witwatersrand, Human Research Ethics Committee (Certificate No. M240736). The study was also registered with the National Health Research Database (GP_202402_061). There was no risk to patients or confidentiality concerns as this was a retrospective record review, and no patient identifiers were collected. Informed consent from individual patients was therefore not required.

Results

Altogether 192 patients were admitted, and 214 admissions were recorded (as some patients were admitted multiple times). Of the 192 patients, 90.62% were admitted once, 7.29% were admitted twice and 2.08% were admitted three times. More female patients were admitted (*N* = 159, 74.29%) than male patients (*N* = 55, 25.70%). Of the total admissions, the median (IQR) age was 36 (from 29 to 51) years. Most of the admissions were between 18 years and 35 years of age (*N* = 105, 49.07%). Most patients were not in a relationship (*N* = 162, 75.70%), most were unemployed (*N* = 186, 86.92%) and almost two-thirds (*N* = 132, 61.68%) had mania with psychotic features. Personality disorders were the most common psychiatric comorbidity (*N* = 32, 14.95%). The majority had comorbid borderline personality disorder (*N* = 17, 7.94%) and antisocial personality disorder (*N* = 8, 3.74%). Of the admitted patients with BD, almost half (*N* = 97, 45.32%) had a medical comorbidity, with a fifth (*N* = 46, 21.49%) being infected with HIV. Most patients had a diagnosis of bipolar I disorder (*N* = 207, 96.72%), with the minority (*N* = 7, 3.27%) being diagnosed with bipolar II disorder (Table 1).

The median (IQR) LOA of the 214 admissions was 23 (range: 13–38) days. Eighteen patients with multiple admissions stayed in the hospital for a median (IQR) of 45 (range: 32–80) days over the duration of data collection. All patients with multiple admissions had a history of substance use and reported ongoing cannabis use. Of the patients admitted, 80 (37.38%) used cannabis, 38 (17.76%) used crystal methamphetamine, 29 (13.55%) used alcohol, 23 (10.75%) used nicotine and 5 (2.34%) used heroin. Over a quarter of the patients (*N* = 58, 27.10%) used two or more substances. Of those who used cannabis, 28 (35.00%) were identified by the MDUT, while 52 (65.00%) were self-reported. No MDUT was performed in 46 (57.50%) patients who reported cannabis use. Of those who used other substances, 21 (22.11%) were confirmed to use other substances *via* the MDUT, while 74 (77.89%) were self- or family-reported. As a result of a lack of resources, some patients did not get an MDUT (Table 2).

No significant association was found between LOA, age, relationship status and employment. Psychiatric, medical comorbidities, cannabis and other substance use were not associated with LOA.

Discussion

This study examined the factors associated with LOA in patients with BD, as well as the relationship between LOA and cannabis use in patients with BD. The decriminalisation of cannabis use in South Africa could increase its use, which may have important clinical implications. The median LOA was 23 days, which aligns with the duration of admission for patients with SMI from other local studies and healthcare facilities in sub-Saharan Africa.[15,19,25] Some studies have reported shorter LOAs, ranging from 9 days to 14 days, in

TABLE 1: Socio-demographic and clinical factors of patients admitted with bipolar disorder at Chris Hani Baragwanath Academic Hospital (*N* = 214).

Variables	Categories	Frequencies	%
Gender	Female	159	74.29
	Male	55	25.70
Relationship	In a relationship	162	75.70
	Not in a relationship	52	24.30
Age groups (years)	18–35	105	49.07
	36–49	48	22.43
	≥50	61	28.50
Employment	Employed	21	9.81
	Students	7	3.27
	Unemployed	186	86.92
Clinical presentation	Depressed with psychosis	4	1.87
	Depressed	8	3.74
	Hypomania	2	0.93
	Mania with psychosis	132	61.68
	Manic	68	31.78
Psychiatric comorbidity†	Mild neurocognitive disorder	17	7.94
	Major neurocognitive disorder	20	9.35
	Personality disorders	32	14.95
	No psychiatric comorbidity	145	67.76
Medical comorbidity‡	No medical comorbidity	118	55.14
	With medical comorbidity	96	44.86
Diagnosis	Bipolar I	207	96.72
	Bipolar II	7	3.27

†, Psychiatric comorbidities excluded substance use disorders.

‡, Other comorbidities were HIV (*N* = 46), hypertension (*N* = 31), diabetes (*N* = 7), dyslipidaemia (*N* = 3), epilepsy (*N* = 1), acne vulgaris (*N* = 1), breast cancer (*N* = 1), gastritis (*N* = 1), hepatitis C (*N* = 1), hydrocephalus (*N* = 1), haemorrhoids (*N* = 1), Polycystic ovarian syndrome (PCOS) (*N* = 1), Traumatic Brain Injury (TBI) (*N* = 1).

patients with mood disorders.[26,27] These studies focused on all mood disorders (such as major depressive disorder); therefore, their results may not be directly generalisable to this study population. Designated psychiatric hospitals in South Africa have reported longer LOA.[28,29,30] This may be because these hospitals are referral centres providing care to patients requiring longer admissions, while the setting of this study was in acute psychiatric care wards.

Approximately 8.41% (N = 18) of the cohort had multiple admissions and stayed longer in the hospital when the duration of all admissions during the study period was considered. They had a median hospital stay of 45 days (IQR: 32–80). In South Africa, the ongoing bed shortage in many facilities may necessitate a higher discharge rate. While this likely contributes to lower LOA, it may potentially contribute to an increase in readmission rates. According to Glick et al., the deinstitutionalisation and shift to community-based care led to lower LOA, thereby, minimising healthcare costs.[31]

TABLE 2: Substance use in admitted patients with bipolar disorder at Chris Hani Baragwanath Academic Hospital.

Variables	Categories	Frequencies	%
Cannabis use (N = 214)	No	134	62.61
	Yes	80	37.38
Other substance use (N = 214)	Alcohol	29	13.55
	Crystal methamphetamine	38	17.76
	Heroin	5	2.34
	Nicotine	23	10.75
	No substance use	119	55.61

TABLE 3: Linear regression to predict the length of hospital admission in patients with bipolar disorder admitted to Chris Hani Baragwanath Academic Hospital.

Variables	Category	Linear regression		
		Coeff.	95% CI	p-value
Age	-	-0.03	-0.43 to 0.36	0.867
Age groups (years)	18–35	Ref	Ref	-
	36–49	-8.0	-23.4 to 7.44	0.309
	≥ 50	3.47	-10.8 to 17.7	0.633
Gender	-	-	-	0.766
	Female	Ref	Ref	-
	Male	-2.1	-15.7 to 11.5	-
Relationship	-	-	-	0.395
	Not in a relationship	Ref	Ref	-
	In a relationship	-7.6	-25.0 to 9.9	-
Employment	-	-	-	0.373
	Unemployed	Ref	Ref	-
	Employed	-9.2	-29.6 to 11.1	-
Psychiatric comorbidities	-	-	-	0.459
	No	Ref	Ref	-
	Yes	4.9	-8.1 to 17.9	-
HIV	-	-	-	0.630
	Negative	Ref	Ref	-
	Positive	3.6	-11.2 to 18.4	-
Medical comorbidity	-	-	-	0.293
	No	Ref	Ref	-
	Yes	6.5	-5.7 to 18.7	-
Cannabis use	-	-	-	0.946
	No	Ref	Ref	-
	Yes	-0.4	-13.0 to 12.1	-
Other substance use	-	-	-	0.992
	No	Ref	Ref	-
	Yes	-0.1	-12.2 to 12.2	-

Note: A p-value < 0.05 indicates statistical significance.
HIV, human immunodeficiency virus; CI, confidence interval.

The socio-demographic profiles of the patients were similar to those reported in other studies.[19,32,33] Most of the patients were young, female, single and unemployed. The median age at admission was 36 years (IQR: 29–51), with 49.07% (N = 105) (Table 1) of admissions occurring in patients aged 18–35. The high proportion of young people in this cohort is consistent with the typical age of onset of BD, which usually manifests in late adolescence and early adulthood.[34] Being older, female and having medical and psychiatric comorbidities were associated with a longer LOA.[34,35]

Most patients were not in a relationship (N = 162, 75.70%) and were unemployed (N = 186, 86.92%) (Table 1). This may reflect the negative impact of BD on patients' lives, affecting their ability to maintain stable employment because of mood instability, cognitive impairments and the stigma they experience.[36] In this study, relationship status was not associated with LOA. This result contradicts the literature, which reports that patients in a relationship have a shorter LOA than those who are not.[37] The shorter LOA was attributed to the partners' involvement in patient management, enhancing early symptom detection and earlier admission.[37] The lack of association between relationship status and LOA may be explained by the fact that not all support comes from an intimate partner. Support from other family members may serve the same purpose and facilitate a shorter LOA.[37]

More female patients (N = 159, 73.44%) were admitted than male patients (N = 55, 26.56%) (Table 1). This was consistent with the literature, which reported that more female patients with BD are admitted, despite a similar prevalence of BD in male and female patients.[38,39] Despite more women being admitted, gender in patients was not a significant predictor of the length of hospital stay (Table 3), which aligns with the findings of similar studies.[14,17] The higher number of female patients' admissions could be explained by factors such as women being more likely to seek professional help from medical and mental health care[40] and the types of medications prescribed.[41] Karanti et al. found evidence of gender bias in the treatment of BD and concluded that, at least in Sweden, clinicians' treatment decisions could be unjustly influenced by their patients' gender. Women were less likely to be prescribed lithium, an acknowledged gold standard for BD maintenance therapy that is associated with less relapses compared to other mood stabilisers.[41,42,43,44] They found that women were mostly prescribed antidepressants, which, when used without adjunctive therapies, worsen rapid cycling and can trigger mania, leading to hospital admissions.[41,45] This study did not explore medication choices among patients admitted with BD and thus could not comment on whether medication choice influenced the admission rate or LOA.

Chris Hani Baragwanath Academic Hospital has a maternal mental health clinic that screens and treats women with mental illnesses. This clinic serves patients with BD who are

pregnant and post-partum from CHBAH and other surrounding community clinics. Consequently, there may be improved screening and identification of women who require admission. The post-partum status of some women may be a factor necessitating a lower threshold for admission, given the urgency to stabilise their condition and minimise risk to their infants. However, the reasons for admission and the pregnancy status of the women admitted were not captured in this study, and so the above interpretation remains speculative.

Over 95% of the admissions were diagnosed with bipolar I disorder. Almost two-thirds of the patients presented with mania along with psychotic symptoms, followed by over 30% of the patients who presented with manic episodes without psychotic symptoms. In contrast, patients admitted with depressive episodes and hypomania are rare. This is expected because admission of patients with BD is mostly indicated in the manic phase, which is difficult to treat on an outpatient basis because of poor treatment adherence or during severe depressive episodes with increased suicide risk.[46] Hypomania usually does not require admission; however, the presence of factors such as comorbid psychiatric disorders (e.g. personality disorders or substance use) may complicate the clinical picture, necessitating admission. Psychosis during manic or depressive episodes is associated with more severe impairments and predicts a more difficult-to-treat disorder; thus, it may be a risk factor for a longer LOA.[47] The clinical presentation of the patients with BD did not influence the LOA, which is consistent with the findings of Shi X et al.[32]

Both medical and psychiatric comorbidities are common in patients with BD.[48] Medical comorbidities have been found to increase LOA in patients with SMI.[48,49] This study collected all medical and psychiatric comorbidities documented by the treating doctors giving the discharge summaries; however, it was beyond the scope of this study to examine how individual diagnoses may have impacted LOA. Over 21.49% of the admitted patients were HIV-infected. This is in keeping with the South African literature, which reports HIV prevalence to be between 20.3% and 26.5% in the South African population with SMI.[50,51] The prevalence of HIV in the South African general population is currently about 12.7%.[52] Individuals with BD are at a higher risk of contracting HIV, as some patients may engage in risky sexual behaviour during manic and hypomanic episodes.[53] The variation in HIV prevalence in patients with SMI is likely explained by multiple factors, including the frequency of routine HIV testing in patients with SMI and the different sampling strategies used during the study.[53,54] Although HIV comorbidity has been associated with a longer LOA,[15,16,17,49] the results of this study did not correlate with this association. It is possible that virological suppression with advances in HIV treatment may have affected this finding, as individuals who are virologically suppressed with higher Cluster of Differentiation 4 (CD4) counts have fewer and shorter LOAs.[55]

Personality disorders were the most common psychiatric comorbidity found in this study; the findings are in consistent with previous literature reporting a higher incidence of borderline and narcissistic personality disorders.[56] Although personality disorders did not affect the LOA in the present study, other studies have demonstrated that the patients with comorbid personality disorders often experience a more severe course of illness.[57]

Cannabis was the most used substance, reported by one-third of patients, followed by crystal methamphetamine and alcohol. Although cannabis was the most frequently used substance, it was not a significant predictor of LOA (Table 3). This finding is relevant because recent South African literature reports that cannabis use may be increasing among patients admitted with SMI following the decriminalisation of home cannabis use in 2018.[23,24] Cannabis use has been associated with several adverse mental health outcomes, including poor treatment adherence and multiple readmissions.[58] However, LOA for a single admission may not capture a clear picture of how cannabis use may impact healthcare costs, as other factors such as the number of admissions, cost of medication and the need for frequent reviews or investigations for monitoring patients, also contribute to overall healthcare expenditure.[59] It is notable that all patients with multiple readmissions used cannabis, resulting in these patients having a net longer duration spent in the hospital. These findings highlight the need for further research with a larger sample size over an extended duration of study period.

Strengths and limitations

As this study was conducted in one facility and was retrospective, the results may not be generalisable to other populations. The sample size may have limited our ability to detect significant associations, particularly with cannabis use. Although women patients in this study had the most admissions, the LOA was similar between the genders. The reason for this remains unclear and requires further exploration of gender-specific factors that influence LOA. The study assessed LOA; however, there is no specific protocol for when patients are discharged. While the patients would not be discharged unless their treating team deemed it appropriate based on the treating team's risk assessment to discharge them, it was beyond the scope of this study to assess factors such as insufficient bed capacity, presence of residual symptoms, levels of support in the home environment and level of patient insight into their illness.

This study relied on BD diagnoses obtained from hospital records. Some patients may have been excluded because they were erroneously diagnosed with substance-induced bipolar and related disorders, as their symptoms occurred in the context of substance use. These patients would only be diagnosed with BD retrospectively if their symptoms occurred independently of substance use. Similarly, the diagnoses were determined by the treating physician and were not independently confirmed in this study. However, as the discharge summary is performed by a psychiatry registrar and reviewed by a consultant, the likelihood of the chances of minimising an erroneous diagnosis is increased.

No association was found between cannabis and LOA, which could be because of other unmeasured factors such as variability in cannabis potency, different usage methods, frequency and patterns of cannabis use. Cannabis use may be under-reported because of limited administration of the MDUT and reliance on self and family reports. While some studies have found some concordance between self-reporting and MDUT, self-reports often lack accuracy and reliability.[60,61] Owing to limited resources at CHBAH, there are times when not all patients receive an MDUT upon admission.

Conclusion

Although the literature examines LOA in patients with SMI in South Africa, there is a paucity of literature specifically examining patients with BD. The findings of this study are similar to those of South African and other low- to middle-income countries and add to the body of knowledge on this topic.[19] This study lays the foundation for exploring the correlations, such as how demographic factors, comorbidities, and substance use can affect LOA. Future research can build on this data to explore intervention strategies that may improve treatment outcomes after establishing the LOA determinants.

Although limited evidence exists regarding LOA in the South African patients with BD, to the best of our knowledge, this study is the first to examine cannabis use and its impact on LOA in this population. Cannabis was the most commonly used substance in this study; however, its use did not affect the LOA. South Africa is a resource-constrained country that requires targeted interventions to reduce LOA. These results do not suggest that reducing cannabis use decreases the LOA in patients with BD. However, this does not mean that decreasing cannabis use would not benefit patients and the healthcare system. Standardised treatment protocols, unmeasured socio-economic factors, medication adherence and comorbid substance use may have confounded the results. Additionally, episode severity and hospital resource constraints could also have influenced the LOA independent of cannabis use. Although these variables may have been confounding factors in this study, the research remains valuable in that it guides future research by identifying patients, diagnostic and treatment facility factors that warrant further exploration as potential factors influencing LOA in patients admitted with BD.

A higher proportion of women with BD were admitted compared to other studies.[19,39,40] This could be because of the increased screening of women with SMI at the CHBAH maternal mental health clinic. It is possible that the high number of female patients admitted with BD was because of the maternal mental health clinic improving screening and detection of women needing admission; this may speak to a lower threshold for admission in women, increased prevalence of women with BD or speak to women with BD having high risk of needing admission, to name a few reasons. This highlights a need for further research examining the reasons for admission of women with BD in this setting.

Also, it is noteworthy that all patients with multiple admissions during the study period had a history of substance use. This suggests a need for further research to evaluate the impact of cannabis use on readmission rates and the cumulative duration of hospitalisation throughout the lifespan among patients with BD.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

CRediT authorship contribution

Sewela R. Mamadi-Moshidi: Conceptualisation; Methodology; Investigation; Data curation; Formal analysis; Writing–original draft; Writing–review & editing; Visualisation; Project administration. Sibulele Zuma: Supervision; Validation; Writing–review & editing. Lisa Galvin: Supervision; Validation; Writing–review & editing. All authors reviewed the article,contributed to the discussion of the results, approved the final version for submission and publication.

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Data availability

The data that support the findings of this study are available from the corresponding author, S.R.M.-M., upon reasonable request.

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