

PREVALENCE OF HYPOKALEMIA IN PSYCHIATRIC INPATIENTS AT GRHASIA MENTAL HOSPITAL YOGYAKARTA

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ORIGINAL ARTICLE

OPEN ACCESS

ABSTRACT

Introduction: Hypokalemia, defined as a serum potassium level below 3.5 mEq/L, is often overlooked in psychiatric patients despite its clinical significance.

Methods: This study examines the prevalence of hypokalemia in psychiatric inpatients at Grhasia Mental Hospital, Yogyakarta, from October to December 2023. A cross-sectional analysis of 365 patient records was conducted.

Results: The majority (74.8%) were diagnosed with schizophrenia spectrum and other psychotic disorders. The overall prevalence of hypokalemia was 28.8%, with 4.9% of cases presenting with potassium levels below 3.0 mEq/L. Bivariate analyses using t-tests, ANOVA, and Pearson correlation showed no significant differences or correlations between serum potassium levels and demographic or clinical factors.

Discuss: Almost one-third of the total psychiatric inpatients at Grhasia Mental Hospital in Yogyakarta experience hypokalemia. This prevalence rate is much higher compared to the general population, where hypokalemia occurs in only 2-5% overall. This high prevalence indicates that patients with mental disorders have a greater risk of experiencing electrolyte disturbances, which can affect their physical and mental condition.

Conclusion: Given the high prevalence, routine electrolyte monitoring in psychiatric inpatients is essential to prevent complications. Further research is needed to explore the impact of antipsychotic medications on potassium regulation and to develop strategies for early detection and management of hypokalemia in psychiatric care.

Keywords: hypokalemia, inpatient, mental disorder.

Article History:

Received: August 28, 2025

Accepted: September 18, 2025

Published: September 30, 2025

Cite this as: Krisniati, T.R., Zahra, F.A., Amalia, N., Sefriyanto, J.H.K., Ardiningrum, W. Prevalence of hypokalemia in psychiatric inpatients at Grhasia Mental Hospital Yogyakarta. *Journal of Psychiatry Psychology and Behavioral Research*; 2025.6:2. p40-44.

INTRODUCTION

Hypokalemia is a condition characterized by serum potassium levels below 3.5 mEq/L.¹ Hypokalemia can be easily identified and is clinically significant, yet it is often overlooked in the examination of psychiatric patients. Previous studies have stated that nearly half of the psychiatric patient population experiences physical conditions, but only one-third are diagnosed. Compared to the prevalence in the general population, the prevalence of hypokalemia in psychiatric patients was reported to be higher, around 20%.²

Hypokalemia can cause neuromusculoskeletal complications and even affect cardiac function.³ In addition, hypokalemia can also manifest in mental conditions resembling psychiatric

disorders and can exacerbate psychosis in schizophrenia patients.⁴ The etiology of hypokalemia in psychiatric patients is often associated with insufficient oral intake, as well as the consumption of certain types of antipsychotics. However, the biological mechanisms by which antipsychotics cause hypokalemia are not yet clearly understood.

Antipsychotic medications are widely prescribed for patients with schizophrenia, mood disorders, and some somatic symptoms. Some antipsychotics, especially first-generation ones, are torsadogenic drugs and are associated with the occurrence of sudden cardiac death (SCD).⁵ One of the important mechanisms of heart complications is marked by the presence of prolonged QT on the electrocardiogram results.⁶

The presence of arrhythmogenic side effects in some of these antipsychotics increases the risk of SCD events when accompanied by severe hypokalemia.²

The journal by Marcussen et al. (2018) examined the relationship between abnormal serum potassium levels and the risk of death within six months in patients receiving combined antipsychotic and diuretic therapy. This registry-based study in Denmark involved 6,729 patients. The results show that hypokalemia (<3.5 mmol/L) increases the risk of death (HR 1.59). This risk is independent of the type of antipsychotic used. This study emphasizes the importance of monitoring potassium levels in patients undergoing antipsychotic therapy, especially when combined with diuretics, as electrolyte disturbances can increase the risk of death.⁷

Considering the significant impact of hypokalemia on psychiatric patients, as well as the high prevalence of hypokalemia among psychiatric patients in previous studies, this study aims to determine the prevalence of hypokalemia in hospitalized psychiatric patients at Grhasia Mental Hospital, Yogyakarta, Indonesia.

METHOD

In this study, a cross-sectional study of the prevalence of hypokalemia was conducted on all psychiatric inpatients who visited Grhasia Mental Hospital during the period from October 2023 to December 2023. Patients were eligible if (1) they had been hospitalized at least once during the October-December 2023 period, (2) they had a psychiatric diagnosis according to ICD-10, and (3) a serum potassium test was conducted within a maximum of 3 days after hospital admission. Patients were excluded if any of the following conditions were present: (1) receiving treatment that can cause hypokalemia, such as diuretics; (2) having a diagnosis of kidney disease and other diseases that can cause hypokalemia, where the diagnosis is made by an internal medicine specialist; (3) unclear data in medical records.

In the subjects, variables collected included sociodemographics, such as age and gender, as well as other variables like previous psychiatric treatment history and mental health diagnosis. In this study, the equivalent dose of psychotropic drugs was not calculated because relapsed inpatients had low medication adherence. Diagnosis is classified into 4 categories: 1) schizophrenia spectrum and other psychotic disorders, 2) bipolar spectrum disorders, 3) depressive spectrum disorders, and 4) others. Patient data were then collected, and descriptive analysis was conducted.

The analysis was conducted using SPSS version 26. Descriptive statistical tests were conducted to observe the prevalence and frequency distribution of various variables. Bivariate analysis was conducted to evaluate differences in mean serum potassium levels across demographic and clinical variables. Independent t-tests were applied for comparisons by sex and history of psychiatric treatment, while one-way ANOVA was used to compare mean potassium levels across psychiatric diagnostic categories. Pearson correlation analysis was performed to assess the linear relationship between age and serum potassium concentration. A p-value of <0.05 was considered statistically significant. Ethical approval was obtained from the Ethics Committee of Grhasia Mental Hospital, Yogyakarta (Approval No: No.30/EC-KEPKRSJG/VI/2024).

RESULT

A total of 377 inpatient medical record data were obtained during the period from October 2023 to December 2023. Out of the 377 patients, 12 were excluded due to the consumption of furosemide, a delirium condition, and a chronic kidney disease condition. The total number of research subjects was 365 patients. Of the 365 patients, 226 (61.9%) were male, and 139 (38.2%) were female.

As many as 288 subjects (78.9%) were patients with a history of previous psychiatric treatment, while 77 (21.2%) were patients without a history of previous treatment. From the diagnosis, the most common diagnosis was the schizophrenia spectrum and other psychotic disorders, which included schizophrenia, schizoaffective disorder, persistent delusional disorder, and acute psychosis, amounting to 273 patients (74.8%). Next was the bipolar disorder spectrum with 23 patients (6.3%), the depression disorder spectrum with 20 patients (5.5%), and other diagnoses, including intellectual retardation, organic mental disorders, dementia, and anxiety disorders, totaling 49 patients (13.4%). (Table 1).

In this study, a prevalence of hypokalemia was found, where potassium levels were 5 meq/L, at 28.8%. Serum potassium measurement was performed within 24 hours of admission. In the study subjects, 18 subjects (4.9%) had potassium levels below 3 meq/L. The lowest potassium level was 2.3 meq/L.

Bivariate analysis was conducted to evaluate differences in mean serum potassium levels by sex, history of psychiatric treatment, and psychiatric diagnosis, as well as the correlation between age and serum potassium concentration. The t-test showed no significant difference in potassium levels by sex ($p = 0.989$) or history of psychiatric treatment ($p = 0.136$). ANOVA analysis across diagnostic groups also showed non-significant results ($p = 0.154$). Pearson correlation between age and potassium levels yielded $r = -0.049$ with $p = 0.352$, indicating no significant linear relationship. (Table 2).

DISCUSS

The results of this study indicate that the prevalence of hypokalemia in psychiatric inpatients at Grhasia Mental Hospital is 28.8%. This figure is higher compared to the prevalence of hypokalemia in psychiatric inpatients reported by Lam et al. at around 20%.² Almost one-third of the total psychiatric inpatients at Grhasia Mental Hospital in Yogyakarta experience hypokalemia. This prevalence rate is much higher compared to the general population, where hypokalemia occurs in only 2-5% overall.⁹ This high prevalence indicates that patients with mental disorders have a greater risk of experiencing electrolyte disturbances, which can affect their physical and mental condition.

In this study, out of a total of 365 patients analyzed, 18 patients (4.9%) experienced hypokalemia with potassium levels of 3.0 mEq/L. The condition of hypokalemia can increase the risk of serious complications, especially neuromuscular and cardiovascular disorders such as potentially fatal arrhythmias. [2,5] Therefore, monitoring potassium levels in inpatient psychiatric patients is very important to prevent further complications.

Hypokalemia in psychiatric patients can be caused by several factors, including 1) lack of nutritional intake and changes in hydration status, 2) use of antipsychotics, and 3) influence of other medical disorders. Patients with psychiatric disorders

often experience eating pattern disturbances due to their mental conditions, such as depression, psychosis, or related eating disorders. Inadequate nutritional intake, especially the deficiency of potassium-rich foods such as fruits and

vegetables, can increase the risk of hypokalemia. 2 The use of antipsychotic drugs is suspected to contribute to hypokalemia through changes in adrenergic activity.

Table 1. Demographics, Spectrum of Psychiatric Diagnoses, and Prevalence of Hypokalemia

			Hypokalemia prevalence*
Sample Size	365		105 (28.8%)
Age (years)	41.02 (SD=14.51)		
Sex	Male	226	
	Female	139	
Antipsychotics History	Yes	288	88 (30.6%)
	no	77	17 (22.1%)
Psychiatric Diagnosis	Spectrum of schizophrenia and other psychotic disorders	273	84 (30.8%)
	Bipolar Spectrum disorder	23	5 (21.7%)
	Depressive spectrum disorders	20	4 (20.0%)
	Others	49	12 (24.5%)

*Hypokalemia is defined as a serum potassium level <3.5 mEq/L

Table 2. Bivariate Analysis of Serum Potassium Levels as a Numerical Variable

Independent Variable	Statistical Test	Test Value	p-value
Sex	t-test	t = 0.014	0.989
Antipsychotics history	t-test	t = -1.493	0.136
Psychiatric diagnosis	ANOVA	F = 1.764	0.154
Age (years)	Pearson correlation	r = -0.049	0.352

In this study, a prevalence of hypokalemia was found, where potassium levels were 5 meq/L, at 28.8%. Serum potassium measurement was performed within 24 hours of admission. In the study subjects, 18 subjects (4.9%) had potassium levels below 3 meq/L. The lowest potassium level was 2.3 meq/L.

The journal by Rehman and Chetia (2017) reported a case of hypokalemia in a schizophrenia patient receiving trifluoperazine at therapeutic doses. The patient experienced symptoms of confusion and autonomic hyperactivity after about two months of drug use, with potassium levels dropping to 3.0 mEq/L. After trifluoperazine was discontinued and replaced with aripiprazole, the potassium levels returned to normal. This study confirms that trifluoperazine can cause hypokalemia, although the exact mechanism is not yet known. Therefore, monitoring potassium levels is necessary when prescribing this medication.¹¹ The journal by Yang et al. (2018) reported a case of hypokalemia caused by the use of the antipsychotics quetiapine and risperidone in a schizophrenia patient. The patient experienced a decrease in potassium levels to 2.7 mmol/L after therapy with both medications, but potassium levels returned to normal after switching to amisulpride. This journal highlights that the exact mechanism of hypokalemia caused by antipsychotics is still unclear. One of the proposed theories is the effect of increased catecholamines, causing the movement of potassium into cells, as well as an aldosterone-like effect that increases potassium excretion through the kidneys.¹²

Previous research has also linked hypokalemia to exacerbations of psychosis. The increase in catecholamine levels due to psychological stress and agitation can cause

hypokalemia by enhancing β 2-receptor activity, which induces the shift of potassium into the cells.⁸ A study by Hatta et al. (1999) found a significant negative relationship between serum potassium levels and agitation levels in acute psychotic patients. Patients with higher levels of agitation tend to have lower potassium levels, and this hypokalemia improves after the patients are sedated.¹³

The case reported in Hong's article shows that hypokalemia can mimic neurovegetative symptoms such as fatigue, apathy, and depression, as well as anxiety symptoms such as irritability and sensory disturbances. Therefore, hypokalemia should be considered in the medical evaluation of patients with acute psychiatric decompensation.¹⁰

Hypokalemia can also be influenced by other medical conditions, such as kidney function disorders or the use of certain medications like diuretics.¹ Therefore, in this study, patients with chronic kidney disease and diuretic use were excluded to ensure that the observed hypokalemia is more specifically related to psychiatric conditions.

Statistical analysis treating serum potassium as a continuous variable demonstrated no significant differences across demographic or clinical groups. Independent t-tests showed no differences in mean potassium levels by sex ($p = 0.989$) or by history of psychiatric treatment ($p = 0.136$). Similarly, ANOVA revealed no significant variation in mean potassium

levels across psychiatric diagnostic categories ($p = 0.154$). Pearson correlation analysis also indicated no significant linear relationship between age and serum potassium concentration ($r = -0.049$, $p = 0.352$).

The absence of significant differences suggests that hypokalemia in this inpatient population is not determined by sex, diagnostic category, treatment history, or age. The lack of association with treatment history may partly reflect poor adherence to antipsychotic medications among relapsed patients, reducing the consistency of drug exposure and its potential effect on potassium regulation. Nevertheless, the relatively high prevalence of hypokalemia underscores the need for routine electrolyte monitoring in psychiatric inpatients, regardless of demographic or diagnostic profile.

Based on the results of this study, several steps that can be taken to address the high prevalence of hypokalemia in inpatient psychiatric patients include:

1. **Routine Electrolyte Screening and Monitoring**
Considering the high prevalence of hypokalemia, potassium level testing should be part of the initial evaluation and regular monitoring of hospitalized psychiatric patients, especially those receiving long-term antipsychotic therapy.
2. **Nutritional Intervention**
Providing education about the importance of adequate food intake, as well as supplying potassium-rich foods such as fruits and vegetables, can help prevent hypokalemia in hospitalized patients.
3. **Evaluation of the Risk of Side Effects of Psychiatric Drugs**
Strict monitoring of drug side effects, especially first-generation antipsychotics that have a risk of torsades de pointes, is very important to prevent more serious complications such as heart arrhythmias.

This study has several limitations that need to be considered. The cross-sectional study design limits the ability to identify causal relationships between risk factors and the occurrence of hypokalemia, as data is only collected at a single point in time. Additionally, the study does not account for the equivalent doses of psychotropic drugs that may affect potassium levels, so the potential influence of drug dosage cannot be analyzed in depth. The use of retrospective data from medical records also has limitations related to the completeness and accuracy of information, such as nutritional status, hydration, and the use of other medications that may act as confounding factors. This study is also limited to a single healthcare facility, making its results less generalizable to a broader population. Additionally, other clinical variables that may be relevant, such as levels of agitation or psychological stress, were not further analyzed. Therefore, further studies with a longitudinal design and a more comprehensive approach are needed to understand the causal relationship between antipsychotic use, psychiatric conditions, and the risk of hypokalemia.

CONCLUSION

This study found a high prevalence of hypokalemia (28.8%) among psychiatric inpatients at Grhasia Mental Hospital. While no significant association was found with psychiatric diagnosis or prior treatment, routine electrolyte monitoring is crucial to prevent complications. Factors such as poor nutrition and antipsychotic use may contribute to hypokalemia. Further

research is needed to understand its causes and improve management in psychiatric care.

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