Original Article

Prevalence, Predictors, and Moderators of Relapse in Severe Mental Disorders: Evidence from Ndera Neuropsychiatric Teaching Hospital, Rwanda

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Abstract

Background
Relapse remains a major challenge in managing mental disorders, particularly in low-resource settings where empirical evidence is limited. This study estimated relapse prevalence and associated factors, and examined whether disorder type and psychological well-being moderated, and self-stigma mediated, the medication adherence–relapse link.

Methods
A cross-sectional study was conducted among 310 outpatients at Ndera Neuropsychiatric Teaching Hospital. Data were collected using structured questionnaires and validated scales measuring relapse, self-stigma, medication adherence, and psychological well-being. Chi-square tests assessed associations, while binary logistic regression identified independent predictors using SPSS version 29.

Results
Relapse prevalence was 76.1% in schizophrenia, 69.4% in bipolar disorder, 47.8% in depression, and 64.9% in substance misuse. Disorder type strongly predicted relapse: schizophrenia (AOR = 3.01, 95% CI: 1.28–7.09) and bipolar disorder (AOR = 2.74, 95% CI: 1.19–6.31) showed significantly higher risk than depression. Substance misuse, self-stigma, poor medication adherence, and low psychological well-being were associated with relapse in crude models but lost significance after adjustment. Moderation analysis revealed psychological well-being significantly strengthened adherence's protective effect, reducing relapse from 91.7% at low adherence to 34.8% at high adherence. Disorder type shaped adherence effects: high adherence reduced relapse only in schizophrenia, with inconsistent effects in other disorders. Self-stigma did not mediate the adherence–relapse link.

Conclusion
Medication adherence alone showed inconsistent effects; its protective role was pronounced in schizophrenia and among patients with high psychological well-being. Relapse prevention should prioritize enhancing adherence in schizophrenia and integrating psychological well-being interventions. Tailoring management to diagnostic subgroups is essential for improving outcomes.

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Background

Mental disorders remain a leading cause of disability and health care burden worldwide, with relapse representing one of the most critical challenges in their management. Relapse, defined as the recurrence or worsening of psychiatric symptoms following a period of recovery, represents one of the most critical challenges in the management of severe mental disorders (SMDs).[1] It is associated with increased stigma, financial strain, and functional decline for patients and their families, often leading to repeated hospitalisations and long-term disability.[2] Relapse is frequently observed across major psychiatric illnesses, though its prevalence varies substantially by diagnosis. It is commonly reported that relapse occurs in 52–92% of patients with schizophrenia, 50–90% of those with substance use disorders,[3] and 65–73% of those with bipolar disorder.[2,4,5] A recent systematic review and meta-analysis across Africa estimated that six in ten individuals with mental illness (60.6%) experience relapse, with rates standing at 61.75% in patients with schizophrenia, 71.00% in bipolar disorder, and 59.90% in substance use disorders [5] Worrying, relapse overall prevalence was highest in sub-Saharan (74%) where Rwanda is located compared other regions, underscoring regional variability.[5]

Schizophrenia is particularly characterised by recurrent psychotic episodes and frequent relapses. Studies indicate that approximately 40% of patients relapse within the first year of hospitalisation, and the monthly relapse risk can reach 3.5%.[5,6] Similarly, bipolar disorder has one of the highest lifetime relapse risks, with up to 90% of patients experiencing at least one episode of recurrence, an average annual relapse rate of 0.6, and nearly half relapsing within two years of recovery from a mood episode,[7] Such recurrent episodes are strongly associated with impaired social functioning, treatment resistance, and cumulative disability.

Multiple factors have been identified as predictors of relapse. Poor medication adherence is consistently shown to be one of the strongest risk factors, with non-adherent patients having more than triple the risk of relapse compared to adherent individuals. [8] Other clinical and psychosocial correlates include severe residual symptoms, limited insight, comorbid substance use, poor social support, and exposure to stigma.[5,9] Beyond their clinical impact, frequent relapses are associated with functional deterioration, cognitive impairments, reduced quality of life, and elevated risk of self-harm, which collectively impose substantial burdens on families and society.[10] The economic consequences are also considerable: relapse increases hospital readmissions, emergency service use, and long-term health care expenditures, while reducing productivity and household income.[11]

Despite the recognised importance of relapse prevention, substantial treatment gaps remain especially wide in low- and middle-income countries (LMICs), where between 76% and 85% of individuals with mental disorders receive no formal care.[11,12] In sub-Saharan Africa, relapse prevalence is estimated at 60.6%, with the highest rates reported in Southern Africa (74%) and lower rates in Eastern Africa (56%). [5] These regional disparities reflect not only clinical risk factors but also contextual challenges, including poverty, limited availability of psychiatric medications, weak follow-up systems, and pervasive stigma at the community level.[13–15] Such structural and sociocultural barriers may exacerbate the risk of relapse, but primary evidence from individual countries remains limited.

In Rwanda, Ndera Neuropsychiatric Teaching Hospital serves as the main national referral facility for mental health care and provides most of the country's specialised psychiatric services. Relapse among patients with severe mental disorders is a growing concern yet remains underexplored, with the few existing studies focusing only on specific subgroups, such as individuals with substance use

disorders[3] or bipolar disorder within psychoeducation programs.[16] Evidence from other regions consistently links relapse to poor medication adherence, high internalized stigma, and low psychosocial well-being, however, there is limited empirical data within the Rwandan context to guide prevention and management strategies. Generating such context-specific evidence is crucial for designing culturally relevant interventions and improving continuity of psychiatric care.

Accordingly, the present study aimed to estimate the prevalence of relapse among adult psychiatric outpatients at Ndera Neuropsychiatric Teaching Hospital and to examine associations between sociodemographic, clinical, and psychosocial factors and relapse. It was hypothesised that higher internalised stigma would be associated with increased odds of relapse, while greater self-esteem and psychological well-being would serve as protective factors. Additionally, poor medication adherence was expected to predict relapse independently of demographic and clinical characteristics, while psychosocial factors-specifically self-esteem, self-stigma and well-being were hypothesised to mediate or moderate the relationship between adherence and relapse. This means that adherence would be most protective among patients with low stigma and high self-esteem and well-being. By generating primary data from a Rwandan psychiatric population, this study contributes evidence needed to inform relapse-prevention strategies, guide clinical decision-making,

Methods

Study design and setting
This cross-sectional, correlational study was conducted at the psychiatric outpatient clinic of Ndera Neuropsychiatric Teaching Hospital, Rwanda. Data were collected over a one-month period (1–31 December 2024) from adult patients attending routine outpatient services.

Sample and procedure
This study included 310 adult outpatients (Mean age = 46.67 years, SD = 5.78; 58.7% male, 41.3% female). . The sample size was calculated using Yamane's formula,[17] based on an estimated annual outpatient population of approximately 2,237 patients, yielding a minimum required sample of 310 at a 95% confidence level.

Participants were recruited using a consecutive sampling approach. During the data collection period, all eligible patients who completed their clinical consultation were consecutively invited to participate until the target sample size was reached. Participants were eligible if they were aged 18 years and above, had a clinically confirmed mental disorder, and were in a stable condition that allowed them to complete study procedures. After providing written informed consent, participants completed self-administered standardized questionnaires in a private room within the outpatient department. One data collector who holds a master's degree in clinical psychology and therapeutics provided uniform instructions, remained available to clarify procedural questions, and ensured that questionnaires were completed independently without influencing responses.

To ensure data quality, questionnaires were reviewed daily for completeness and consistency and missing or unclear responses were addressed immediately with participants when appropriate. All questionnaires were anonymized using unique identification codes. Completed forms were securely stored, and electronic data were password-protected, with access restricted to the research team.

Measures
All instruments, including the sociodemographic and clinical questionnaire, were translated into Kinyarwanda, culturally adapted, and pilot-tested prior to the main study in collaboration with university researchers and clinicians from Ndera Neuropsychiatric Teaching Hospital to ensure clarity and contextual relevance.

Sociodemographic data

Information on age, sex, marital status, education, occupation, income, diagnosis, treatment history, and other background characteristics was collected using a structured form (Questionnaire)

Assessment of Relapse

Relapse was evaluated as a binary outcome (yes/no). Participants were asked to report the number of times they had been readmitted to the hospital following recovery from a previous episode. Any readmission after recovery was coded as a relapse ("yes"), whereas no history of readmission was coded as no relapse ("no").

Rosenberg Self-Esteem Scale (RSES)

Self-esteem was assessed using the Rosenberg Self-Esteem Scale (RSES), a 10-item instrument that evaluates global self-worth with five positively and five negatively worded items [18]Responses are scored on a 4-point Likert scale, with higher scores reflecting higher self-esteem. The Cronbach's alpha for this study was 0.75.

Self-Stigma Inventory for Patients (SSI-P)

Self-stigma was measured using the SSI-P, a 19-item instrument designed specifically for individuals with mental illness[19] Items were derived from patient experiences and rephrased for clarity. Scores reflect the extent of internalised stigma, with higher scores indicating greater stigma. The Cronbach's alpha in this study was 0.91.

Medication Adherence Rating Scale (MARS)

Adherence was assessed with the MARS, developed to overcome limitations of earlier adherence tools such as the Drug Attitude Inventory (DAI) and the Medication Adherence Questionnaire (MAQ).[20] The scale provides a reliable measure of adherence to psychotropic medications. Internal consistency in this study was 0.92.

Ryff's Psychological Well-Being Scale (RPWBS)

Psychological well-being was assessed with Ryff's 42-item scale[21] which measures six dimensions: self-acceptance, autonomy, environmental mastery, purpose in life, positive relationships, and personal growth. Items are scored on a 6-point Likert scale, with higher scores reflecting better well-being. The Cronbach's alpha for this study was 0.70.

Statistical analysis

Data were analysed using SPSS version 29. Descriptive statistics (means, standard deviations, frequencies, and percentages) were computed to summarise sociodemographic, clinical, and psychosocial characteristics of the sample. For continuous independent variables such as stigma, psychological well-being, and medication adherence, scores were transformed into rank-ordered tertiles (three categories representing low, moderate, and high levels) to facilitate comparability with categorical predictors. Bivariate associations between relapse and independent variables were assessed using Pearson's chi-square tests for categorical predictors. Binary logistic regression models were then fitted to identify independent predictors of relapse, first in unadjusted models and subsequently in adjusted models controlling for potential confounders.

Moderation and mediation analyses were conducted using the PROCESS macro version 4.1.[22] Specifically, Model 1 was applied to test whether psychological well-being and type of disorder moderated the association between medication adherence and relapse, while Model 4 was used to test whether self-stigma mediated this relationship. All analyses employed a significance thresholdof $p < 0.05$, with odds ratios (OR) and 95% confidence intervals (CI) reported for logistic regression models. Model fit was evaluated using −2 Log Likelihood and pseudo-R^2 statistics (Cox & Snell, Nagelkerke).

Ethical considerations

The study was approved by the Institutional Review Board of the College of Medicine and Health Sciences,

University of Rwanda (Ref: CMHS/IRB/724/2024) and by the Ethics Committee of Ndera Neuropsychiatric Teaching Hospital (Ref: 1316/NNPTH/DG/2024). Written informed consent was obtained from all participants before data collection. Participation was voluntary, and confidentiality was maintained throughout in line with the Declaration of Helsinki.

Results Presentation

Sociodemographic and clinical characteristics

The sociodemographic and clinical characteristics of respondents revealed that relapse was more frequent across most categories, though statistical significance varied by factor (Table 1). Age, sex, marital status, occupation, family monthly income, and education level showed no significant association with relapse status (p > 0.05). However, type of mental disorder was significantly associated with relapse (p = 0.035), with the highest relapse observed among individuals with schizophrenia (76.1%) and bipolar disorder (69.4%), whereas depression showed a relatively lower relapse proportion (47.8%). Furthermore, stigmatisation was also significantly related to relapse (p = 0.038), with a higher proportion of relapse among stigmatised individuals (73.4%) compared to those not stigmatised (61.7%). Similarly, self-stigma demonstrated a significant association (p = 0.012), where relapse was highest in the moderate self-stigma group (74.7%) and lowest among those with low self-stigma (55.6%). Medication adherence showed the strongest association (p < 0.001), as individuals with low adherence had higher rates of no relapse (51.1%) compared to those with moderate or high adherence, who experienced relapse more frequently (72.7% and 73.6%, respectively). Other factors such as comorbidity, suicidal ideation, self-esteem, and psychological well-being did not show statistically significant associations with relapse. Overall, mental disorder type, stigmatisation, self-stigma, and medication adherence emerged as the most influential factors associated with relapse in this sample.

Table 1. Sociodemographic characteristics of the respondents

Variable		No relapse N (%)	Relapse N (%)	Pearson chi-square (P-value)
Age Category				0.127
	18-35 years	59 (36.9)	101 (63.1)	
	36-55 years	35 (28.2)	89 (71.8)	
	56 and above	12 (46.2)	14 (53.8)	
Sex				.100
	Male	69 (37.9)	113 (62.1)	
	Female	37 (28.9)	91 (71.1)	
Marital status				.560
	Single	66 (36.5)	115 (63.5)	
	Married	29 (31.5)	63 (68.5)	
	Widow/widower	3 (21.4)	11 (78.6)	
	Separated	7 (41.2)	10 (58.8)	

Note: *. The Chi-square statistic is significant 0.05 level.

Table 1. Continued

Variable		No relapse N (%)	Relapse N (%)	Pearson chi-square (P-value)
Occupation				.722
	No	68(33.5)	135(66.5)	
	Yes	38(35.5)	69(64.5)	
Family Monthly				.291
	Below 120, 000 rwf	73(32.4)	152(67.6)	
	Above 120, 000 rwf	33(38.8)	52(61.2)	
Education level				.608
	Illiterate	7(29.2)	17(70.8)	
	Primary Education	30(30)	70(70)	
	O level	13(36.1)	23(63.9)	
	TVET	7(38.9)	11(61.1)	
	Secondary	34(41.5)	48(58.5)	
	University	15(30)	35(70)	
Mental disorder				.035*
	Schizophrenia	17(23.9)	54(76.1)	
	Bipolar disorder	19(30.6)	43(69.4)	
	Depression	24(52.2)	22(47.8)	
	substance misuse	13(35.1)	24(64.9)	
Having a comorbid mental disorder				
	No	88(33.7)	173(66.3)	
	Yes	18(36.7)	31(63.3)	
Suicidal ideation				
	No	74(34.7)	139(65.3)	.76
	Yes	32(33)	65(67)	
Are you stigmatized				
	No	77(38.3)	124(61.7)	.038*
	Yes	29(26.6)	80(73.4)	
Self-esteem				.815
	Low	34(33.7)	67(66.3)	
	Moderate	33(32.4)	69(67.6)	
	High	39(36.4)	68(63.6)	
Self-stigma				.012*
	Low	48(44.4)	60(55.6)	
	Moderate	25(25.3)	74(74.7)	
	High	33(32)	70(68)	
Psychological wellbeing				.092
	Low	40(41.7)	56(58.3)	
	Moderate	37(34.6)	70(65.4)	
	High	29(27.1)	78(72.9)	
Medication adherence				<.001*
	Low	28(26.4)	78(73.6)	
	Moderate	30(27.3)	80(72.7)	
	High	48(51.1)	46(48.9)	

Note: *. The Chi-square statistic is significant 0.05 level.

Risk factors of relapse among Ndera neuropsychiatric patients

Table 2. Risk factors of relapse among Ndera neuropsychiatric patients

Variable	Unadjusted model		Adjusted model
	Category	Exp(B) (95% CI)	Exp(B) (95% CI)
Age category			
	18–35 yrs	2.18* (0.92–5.17)	2.39 (0.82–6.98)
	36–55 yrs	1.47 (0.64–3.38)	1.51 (0.53–4.29)
	56+ yrs	1.00	1.00
Sex			
	Female	1.50 (0.92–2.44)	1.06 (0.56–2.01)
	Male	1.00	1.00
Mental disorder			
	Depression	1.00	1.00
	Schizophrenia	3.47 (1.57–7.67)**	3.01 (1.28–7.09)*
	Bipolar disorder	2.47 (1.12–5.45)*	2.74 (1.19–6.31)*
	Substance misuse	2.01 (0.83–4.90)	1.71 (0.66–4.43)
Medication adherence			
	Low	2.91 (1.61–5.25)***	1.91 (0.86–4.24)
	Moderate	2.78 (1.55–4.98)***	1.66 (0.72–3.84)
	High	1.00	1.00
Self-stigma			
	Low	1.00	1.00
	Moderate	1.70 (0.97–2.98)*	0.92 (0.40–2.11)
	High	2.37 (1.31–4.28)**	1.80 (0.81–4.02)
Psychological well-being			
	High	1.00	1.00
	Moderate	1.35 (0.77–2.39)	1.20 (0.55–2.63)
	Low	1.92 (1.07–3.46)*	1.69 (0.78–3.65)

Note: **p≤0.01, *p≤0.05,

The analysis of risk factors for relapse among patients attending Ndera Neuropsychiatric Hospital revealed several important sociodemographic and clinical predictors, though many effects attenuated in the adjusted model (Table 2). In the unadjusted model, younger patients aged 18–35 years had higher odds of relapse compared with those aged 56 years and above (OR = 2.18, p = 0.075), but the association remained non-significant after adjustment (18–35 years: OR = 2.39, p = 0.112; 36–55 years: OR = 1.51, p = 0.439). Similarly, sex was not a significant predictor, with females showing slightly higher odds in the unadjusted model (OR = 1.50, p = 0.105) but no association after adjustment (OR = 1.06, 95% CI: 0.56–2.01, p = 0.858). Type of mental disorder emerged as a strong predictor of relapse. Patients with schizophrenia were over three times more likely to relapse compared to those with depression in both models (UOR = 3.47, 95% CI: 1.57–7.67, p = 0.002; AOR = 3.01, p = .011). Similarly, bipolar disorder was significantly associated with relapse (unadjusted OR = 2.47, p = .025; adjusted OR = 2.74, 95% CI: 1.19–6.31, p = 0.018). Substance misuse showed elevated odds in the unadjusted model (OR = 2.01, p = 0.122) but remained nonsignificant after adjustment (OR = 1.71, p = 0.264).

Medication adherence was a strong predictor of relapse in unadjusted analyses, where both low adherence (OR = 2.91, p < 0.001) and moderate adherence (OR = 2.78, p < 0.001) were associated with significantly higher relapse risk compared to high adherence. However, these associations weakened and lost significance in the adjusted model (low adherence: OR = 1.91, p = 0.112; moderate adherence: OR = 1.66, 95% CI: 0.72–3.84, p = 0.228).

Regarding psychosocial factors, self-stigma showed a graded effect in the unadjusted analysis, with high stigma significantly associated with relapse (OR = 2.37, p = 0.004), while moderate stigma was borderline significant (OR = 1.70, p = 0.063). After adjustment, both effects attenuated and became nonsignificant (moderate stigma: OR = 0.92, p = 0.837; high stigma: OR = 1.80, p = 0.146). Psychological well-being also demonstrated significance in the unadjusted model,

with low well-being linked to greater relapse odds (OR = 1.92, p = 0.028), but the effect weakened in the adjusted analysis (OR = 1.69, 95% CI: 0.78–3.65, p = 0.180). The overall logistic regression model demonstrated acceptable fit, with a –2 Log Likelihood of 253.39 and pseudo R² values of 0.101 (Cox & Snell) and 0.140 (Nagelkerke), suggesting that the predictors explained approximately 10–14% of the variance in relapse. Taken together, schizophrenia and bipolar disorder emerged as the most robust independent predictors of relapse, while the effects of medication adherence, stigma, and psychological well-being weakened after accounting for other variables.

Moderating effects of psychological well-being on the relationship between medication adherence and relapse

The moderation analysis showed that self-reported psychological well-being significantly moderated the relationship between medication adherence and relapse (Table 3).

Table 3: Moderating effects of psychological wellbeing on relationship between medication adherence and relapse

Psychological well-being category	Adherence category	OR	95% CI for OR	Estimated probability of relapse
High well-being	Low adherence (reference)	1		50.0%
	Moderate adherence	2.17	0.81 – 5.83	68.4%
	High adherence	1.15	0.41 – 3.24	53.6%
Moderate well-being	Low adherence	1		67.9%
	Moderate adherence	1.67	0.54 – 5.07	77.8%
	High adherence	0.54	0.20 – 1.47	53.5%
Low well-being	Low adherence	1		91.7%
	Moderate adherence	0.24*	0.07 – 0.83	72.2%
	High adherence	0.05**	0.01 – 0.18	34.8%

Note: **p≤0.01, *p≤0.05,

At high psychological well-being, adherence did not significantly predict relapse (moderate vs high: OR = 2.17, 95% CI [0.81, 5.83], p = 0.126; low vs high: OR = 1.15, 95% CI [0.41, 3.24], p =0.786), with estimated relapse probabilities at low wellbeing level were 50.0% for low adherence, 68.4% for moderate adherence, and 53.6% for high adherence. A similar pattern was observed at moderate wellbeing (moderate vs low: OR = 1.15, 95% CI [0.41, 3.24], p =0.786; , OR = 0.54, 95% CI [0.20, 1.47], p = 0.231), with predicted probabilities indicating relapse in 67.9% of those with low adherence, 77.8% with moderate, and 53.5% with high adherence (Figure 1).

In contrast, at high psychological well-being, adherence was strongly protective. Patients with moderate adherence had significantly lower relapse risk compared to those with low adherence (OR = 0.24, 95% CI [0.07, 0.83], p = 0.025), and those with high adherence showed an even greater reduction (OR = 0.05, 95% CI [0.01, 0.18], p < 0.001). The corresponding relapse probabilities decreased from 91.7% under low adherence to 72.2% with moderate adherence and further to 34.8% with high adherence (Figure 1).
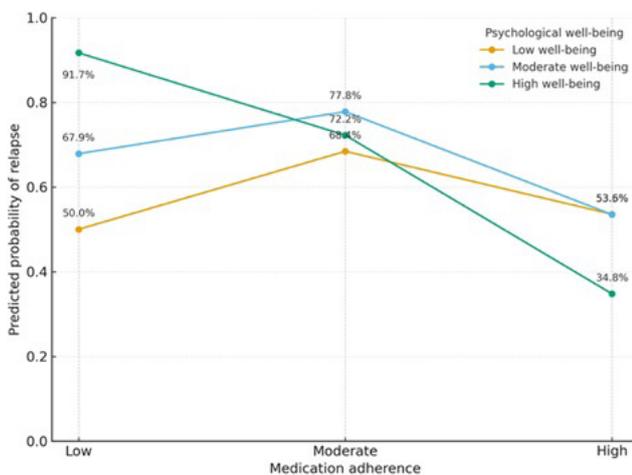

Figure 1. Interaction of psychological well-being and medication adherence on relapse

Taken together, these findings highlight a significant moderation effect: the influence of adherence on relapse is contingent on psychological well-being. While adherence does not substantially alter relapse risk at low or moderate well-being, at high well-being, greater adherence is associated with markedly reduced relapse probabilities, underscoring the protective synergy between psychological well-being and treatment adherence.

Moderating Role of Disorder Type on the Association Between Medication Adherence and Relapse

The moderation analysis examined whether the type of mental disorder moderated the relationship between medication adherence and relapse among 216 patients (Figure 2). The overall interaction term was not statistically significant ($x^2(6)$= 7.72, p =0.259), suggesting that the moderating effect of disorder type was limited. Nonetheless, inspection of conditional effects and predicted probabilities reveals clinically relevant patterns. Taking depression as the reference group, patients with schizophrenia showed significantly higher odds of relapse (, OR = 5.00, 95% CI [1.08, 23.07], p = 0.039,), while those with bipolar disorder also had elevated risk (OR = 13.50, 95% CI [2.74, 66.02], p = .001). In contrast, substance misuse was not significantly different from depression (OR = 2.80, 95% CI [0.53, 14.73], p = 0.224).

Across adherence categories, distinct patterns emerged. Among depressed patients (reference group), predicted relapse probabilities were 33.3% at low adherence, 62.5% at moderate adherence, and 44.4% at high adherence, indicating that moderate adherence paradoxically conferred greater relapse risk compared to both low and (low), 70.0% (moderate), and 66.7% (high), suggesting consistently high relapse risk across adherence levels with little benefit of improved adherence. In contrast, schizophrenia was associated with markedly elevated relapse risk:

probabilities were 87.1% (low adherence), 77.8% (moderate adherence), and 46.2% (high adherence), showing that only high adherence substantially reduced relapse risk. Patients with substance misuse showed intermediate levels of risk, with relapse probabilities of 58.3% (low), 73.3% (moderate), and 60.0% (high).

Taken together, these results suggest that while the type of disorder exerts a strong independent effect on relapse, the role of medication adherence varies across conditions. High adherence significantly reduced relapse risk only in schizophrenia, while in depression and bipolar disorder, the expected protective effect of adherence was not consistently observed. These findings underscore the importance of tailoring relapse prevention strategies not only to adherence levels but also to diagnostic subgroups, with particular emphasis on enhancing adherence among patients with schizophrenia.

Figure 2. Interaction of type of mental disorder and medication adherence on relapse

Mediation of Self-Stigma in the Association Between Adherence and Relapse
Mediation analysis tested whether self-stigma explained the link between medication adherence and relapse among 310 patients. Adherence significantly predicted self-stigma (F(2,307) = 27.10, p < .001, R² = 0.15),

with both moderate (B = –0.28, p = 0.009) and high adherence (B = –0.79, p < .001) associated with reduced stigma compared to low adherence.

Self-stigma, however, was not statistically significantly related to relapse (B = 0.08, p = .639), and indirect effects of adherence via stigma were non-significant. Direct effects showed that high adherence predicted lower relapse (B = –1.01, p = 0.002, OR = 0.36, 95% CI [0.19–0.69]), while moderate adherence did not differ from low adherence. These results indicate that although adherence reduces self-stigma, stigma does not mediate its protective effect on relapse, which appears largely direct.

Overall, these findings suggest that self-stigma does not mediate the relationship between adherence and relapse in this sample. Instead, the protective effect of high adherence on relapse appears to be largely direct and independent of patients' experiences of stigma.
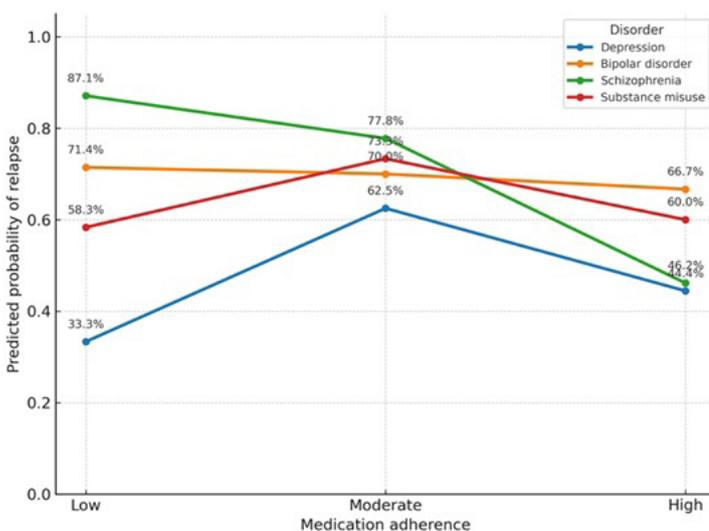
Discussion

The aim of this study was to examine sociodemographic, clinical, and psychosocial risk factors for relapse among psychiatric patients at Ndera Neuropsychiatric Hospital, and to assess potential moderating and mediating mechanisms. Given the high burden of mental disorders and their recurrent nature, understanding the determinants of relapse is critical to improving treatment outcomes and informing tailored interventions. The findings revealed that while age and sex were not significant predictors, clinical variables carried greater explanatory power. Schizophrenia and bipolar disorder emerged as the most robust independent predictors of relapse, with patients in these groups more than three times as likely to relapse compared with those with depression. Medication adherence, self-stigma, and psychological well-being were associated with relapse in unadjusted models, but their effects attenuated after adjustment.

Interestingly, moderation analyses further demonstrated that psychological well-being significantly modified the effect of adherence, while disorder type influenced relapse patterns across adherence levels. Mediation analysis indicated that self-stigma did not explain the link between adherence and relapse, with the effect of adherence remaining largely direct. These findings are broadly consistent with prior studies emphasizing the heightened relapse risk in schizophrenia and bipolar disorder, reflecting the recurrent nature of these conditions.[5,23–25] The robust association between schizophrenia and relapse and bipolar disorder and relapse aligns with the neurobiological underpinnings of these disorders, characterized by chronic dysregulation of neurotransmitter systems and vulnerability to environmental stressors. These findings are broadly consistent with prior studies emphasizing the heightened relapse risk in schizophrenia and bipolar disorder.[26–28]

Similarly, the protective role of medication adherence has been well established, [29,30] although in this study its independent effect weakened after adjustment, possibly due to confounding with disorder severity or multicollinearity with other clinical variables.

Several variables that showed associations in unadjusted models became non-significant after adjustment, warranting careful interpretation. Age was not a significant predictor of relapse in the adjusted model, despite younger patients showing elevated odds in unadjusted analyses. This finding contrasts with some studies that report higher relapse rates among younger patients due to poorer adherence, substance use, and psychosocial instability.[31,32] However, other research has found no significant age effect after controlling for clinical factors,[33,34] consistent with our results. The attenuation in our study likely reflects confounding by disorder type and adherence: younger patients may be overrepresented among those with schizophrenia or substance misuse disorders, and once these factors are accounted for, age itself loses predictive power.[34] Additionally, in the Rwandan context, younger patients may have differential access to family support or community resources that buffer relapse risk, thereby masking age effects.[35]

Sex also did not emerge as a significant predictor after adjustment, despite females showing slightly elevated odds in unadjusted models. This is consistent with scholars that have found no independent sex differences in relapse after adjusting for clinical and psychosocial factors.[30,36] While some research suggests that women may experience higher rates of depression relapse and men higher rates of substance-related relapse, [33] these patterns are often mediated by disorder type, adherence, and social support, all of which were included in our model. [33,37] The non-significance of sex in this study may also reflect the relatively balanced gender distribution in our sample and the possibility that gender-specific risk factors (e.g., reproductive health issues, gender-based violence) were not directly measured.[38]

Medication adherence showed strong associations with relapse in unadjusted models but lost significance after adjustment. This attenuation is somewhat unexpected given the robust evidence linking non-adherence to relapse across psychiatric disorders.[30] However, similar patterns have been reported in studies with strong confounding by disorder severity, symptom burden, or cognitive impairment. [39–41] In our study, the inclusion of disorder type likely captured much of the variance previously attributed to adherence, as patients with schizophrenia, who have the highest relapse risk, also tend to have the poorest adherence due to cognitive deficits, lack of insight, and medication side effects.[41] Moreover, the moderation analyses revealed that adherence effects varied significantly by psychological well-being and disorder type, suggesting that the main effect of adherence may be obscured when

these interactions are not accounted for in the primary model.[42] The weakened effect may also reflect measurement issues: self-reported adherence may not capture the full complexity of medication-taking behaviour, including irregular dosing, partial adherence, or medication discontinuation due to stock-outs, a common issue in resource-limited settings like Rwanda.[43]

Self-stigma demonstrated a graded effect in unadjusted analyses but became non-significant after adjustment. This contrasts with evidence elsewhere, where internalized stigma has been found to independently predict poor treatment engagement, social withdrawal, and relapse.[9,44] These discrepancies may be due to cultural differences in stigma expression and contextual barriers to care in Rwanda, where structural limitations, such as drug stock-outs, financial constraints, and fragmented continuity of care, may play a stronger role in relapse than psychosocial factors alone.Self-stigma demonstrated a graded effect in unadjusted analyses but became non-significant after adjustment. This contrasts with evidence from high-income countries where internalized stigma has been found to independently predict poor treatment engagement, social withdrawal, and relapse.[44,45] However, studies from sub-Saharan Africa have yielded mixed results, with some finding stigma effects attenuated by structural barriers such as poverty, transportation difficulties, and medication shortages.[46,47] In Rwanda, where mental health services are limited and community-based care is still developing, structural and systemic factors may overwhelm the influence of individual psychosocial variables.[48,49] Additionally, the relationship between stigma and relapse may be indirect, mediated by adherence or social support, pathways that were partially controlled in our adjusted model.[50] The mediation analysis further confirmed that stigma did not mediate the adherence–relapse pathway, suggesting that while stigma affects treatment engagement, its impact on relapse may be secondary to pharmacological and clinical factors.[51]

Psychological well-being showed that low self-reported psychological well-being associated with greater relapse odds in unadjusted models, though this effect weakened after adjustment. This finding is consistent with the general expectation that lower well-being would increase vulnerability to relaps.[52,53] One plausible explanation is that patients with compromised psychological well-being may experience reduced capacity for self-care, decreased treatment engagement, and heightened stress reactivity, all of which contribute to relapse risk, particularly when adherence is suboptimal.[54] Another possibility is measurement complexity: the well-being scale may reflect current mood states or transient distress rather than stable psychological resilience, leading to associations that attenuate when clinical factors are controlled.[55]

Importantly, the moderation analysis revealed that well-being significantly interacted with adherence: at high well-being, adherence was strongly protective, whereas at low or moderate well-being, adherence had little effect. This suggests that well-being may function not as a direct predictor but as a contextual moderator that amplifies or diminishes the benefits of adherence .[59] Such complexity would not be captured in a main-effects-only model, explaining the non-significance in adjusted analyses.

Substance misuse showed elevated but non-significant odds in both unadjusted and adjusted models. While substance use disorders are well-established risk factors for relapse in psychiatric populations ,[56,57] the lack of significance in our study may reflect sample size limitations within this diagnostic subgroup or heterogeneity in substance use patterns (e.g., alcohol vs. cannabis vs. other drugs).[57] In the Rwandan context, where substance use is stigmatized and underreported, measurement error due to social desirability bias may have further attenuated observed associations.[58]

A notable contribution of this study lies in its examination of moderating and mediating mechanisms. The interaction of adherence with psychological well-being showed that high well-being potentiates the protective effect of adherence: at high well-being, high adherence reduced relapse risk dramatically, with relapse probabilities dropping from over 90% under low adherence to 35% with high adherence. By contrast, disorder type appeared to shape the adherence–relapse relationship differently across diagnoses: in schizophrenia, only high adherence reduced relapse substantially, whereas in bipolar disorder, relapse remained high regardless of adherence. The mediation analysis provided further insight, showing that while adherence reduced stigma, stigma itself did not predict relapse, suggesting that the pathway from adherence to relapse is largely pharmacological and direct rather than psychosocial. These nuanced findings underscore the importance of tailoring relapse-prevention strategies by diagnosis and integrating psychosocial interventions with clinical management.

The findings must also be interpreted in light of the Rwandan mental health care system, where resource limitations, stigma, and fragmented continuity of care may exacerbate relapse risk. In such contexts, the high relapse rates among schizophrenia and bipolar patients may reflect both the biological nature of these disorders and structural barriers to sustained treatment adherence, including drug stock-outs, financial constraints, and limited specialist services. The observed influence of stigma, though attenuated in adjusted models, also reflects the broader sociocultural context, where mental illness remains stigmatized within communities, potentially reducing patients' motivation to remain in care. These contextual dynamics highlight the necessity of system-level interventions in Rwanda, including public awareness campaigns, strengthening of community-based follow-up, and psychosocial support programs.

Study Strengths and Limitations

A key strength of this study is the use of a relatively large clinical sample and the application of both moderating and mediating models, which allowed for the identification of the mechanism by which medication adherence is linked to relapse. The study also examined a broad range of sociodemographic, clinical, and psychosocial variables, thereby offering a comprehensive picture of relapse risk factors. However, some limitations must be acknowledged. First, the cross-sectional design precludes causal inference, as the observed associations cannot establish temporal precedence. Second, the reliance on self-reported measures for variables such as relapse, stigma, self-esteem, and medication adherence may have introduced response or recall bias. Third, the model explained only 10–14% of the variance in relapse, suggesting that unmeasured factors such as domestic violence, family support, treatment quality, or biological markers likely play an important role. Finally, the study was conducted at a single specialised hospital, which may limit generalizability to other psychiatric care settings in Rwanda or beyond.

Conclusion

Overall, schizophrenia and bipolar disorder were the strongest independent predictors of relapse, while the roles of adherence, stigma, and psychological well-being were more complex, varying by context and diagnostic group. High adherence was protective primarily among patients with schizophrenia and those with high psychological well-being, highlighting the value of integrating pharmacological management with psychosocial support. Self-stigma did not mediate relapse, suggesting that stigma reduction, while important for engagement and recovery, may not directly alter relapse trajectories in this setting. Future longitudinal studies are needed to clarify causal pathways and to investigate how systemic and social factors interact with clinical variables to shape relapse risk in low-resource contexts.

Consent for publication
Not applicable

Competing interests
Not applicable

Authors' contributions
CN, PU, SN, EFT, EK, NE, FUB, JCM, MN, MA and JN contributed to the study design, data collection and field coordination. PU, EN and JN conducted data entry and preliminary analysis. BU and SF supervised clinical validation and data quality control. FN and JN performed the main statistical analyses and interpreted the results. JN drafted the manuscript with input from FN. All authors critically reviewed the manuscript, contributed to revisions, and approved the final version.

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