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Article

Suicide Attempts and Their Correlates in Female Inpatients with Schizophrenia: A Cross-sectional Study in China

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Abstract

Objectives: This study aimed to investigate the prevalence and risk factors for both recent and lifetime suicide attempts among female inpatients with schizophrenia. **Methods:** A retrospective case-control study was conducted involving 201 female inpatients. Data on demographics, clinical characteristics, and suicide attempts were collected. History of suicide attempts was ascertained from reports from both participants and their family members. Psychometric assessments included the Positive and Negative Syndrome Scale (PANSS), the Hamilton Depression Rating Scale (HAMD-17), and the Hamilton Anxiety Rating Scale (HAMA). Laboratory parameters were obtained from baseline blood samples collected at admission. Multivariate logistic regression was used to identify independent risk factors. **Results:** 11.44% of participants attempted suicide within one month prior to admission, and 21.39% reported a lifetime history of suicide attempts. Multivariate analysis revealed that previous suicide attempts (OR=6.45, 95% CI: 2.27–18.34, $p<0.001$), with delusions of being controlled (OR=4.60, 95% CI: 1.46–14.52, $p=0.009$) and HAMA score (OR=1.15, 95% CI: 1.06–1.26, $p=0.001$) were independent risk factors for recent suicide attempts. For lifetime attempts, being married (OR=2.17, 95% CI: 1.02–4.62, $p=0.045$), HAMA score (OR=1.11, 95% CI: 1.04–1.19, $p=0.003$), and PANSS total score (OR=1.02, 95% CI: 1.003–1.04, $p=0.025$) were independent risk factors. **Conclusion:** Suicide attempts are prevalent among female inpatients with schizophrenia. The findings highlight the critical role of specific clinical symptoms over demographic factors. Routine assessment and targeted management of these symptoms are essential for enhancing suicide prevention strategies in this high-risk population.

Keywords: suicide; schizophrenia; female; anxiety; delusions of being controlled

1. Introduction

Schizophrenia (SCZ) is a chronic and severe psychiatric disorder characterized by core symptoms of hallucinations, delusions, and cognitive impairments, which often follow a progressive, deteriorating course [1]. It affects approximately 1% of the global population, with over 6 million individuals living with SCZ in China alone [2–4]. SCZ is associated with profound health disparities. Individuals living with SCZ have a life expectancy 15–20 years shorter than the general population [5]. Furthermore, they frequently face barriers to comprehensive care, exacerbating gaps in supportive services that demand cross-sectoral societal intervention [6,7].

Among the various threats to their survival and well-being, suicide stands out as a leading contributor to the elevated premature mortality in this population [8]. The suicide risk in SCZ is 10 times higher than that of the general public, with 20%-50% of patients attempting suicide during their lifetime and 10%-20% dying by suicide [8–11]. While suicide mortality peaks in the early stages of SCZ [12], the risk can persist into chronic phases and older age [13,14]. This sustained vulnerability underscores the urgency of identifying modifiable risk factors to inform targeted preventive strategies.

The elevated suicide risk in SCZ is multifactorial, with well-documented contributors encompassing clinical, psychological, and social domains [15,16]. Clinically, symptom severity is a critical driver of suicidal risk in SCZ. Severe psychotic symptoms often induce despair and hopelessness, directly increasing suicidal ideation [12]. Psychologically, comorbid depressive and anxiety symptoms, which are prevalent in up to 40% of individuals affected by SCZ, exacerbate emotional distress [17]. Socially, stigma (e.g. discrimination in employment or relationships) and social isolation may erode coping resources, culminating in suicidal behaviors [18,19]. Furthermore, limited access to timely mental healthcare amplifies these risks, creating a cascading effect on suicide vulnerability in this population [20].

However, risk factors for suicide do not manifest uniformly across genders [21]. Female patients with SCZ represent a critically understudied subgroup with distinct vulnerability profiles. Female patients are more likely to experience severe anxiety symptoms than males [22]. Furthermore, gender-specific biological factors, such as fluctuations in sex hormones and differences in metabolic markers [23,24], may contribute to differential risk pathways, which have not been insufficiently investigated in SCZ. To address these gaps, the present study aimed to investigate the prevalence and associated risk factors of both recent and lifetime suicide attempts among female inpatients diagnosed with SCZ. By focusing exclusively on female inpatients, our findings provided evidence for informing gender-sensitive risk assessment and developing targeted, gender-sensitive suicide prevention strategies.

2. Materials and Methods

2.1. Study Design and Subjects

This retrospective case-control study involved female inpatients admitted to a specific ward of Beijing Anding Hospital between January 2024 and May 2025. Eligible participants were 15–65 years with a confirmed diagnosis of schizophrenia based on the International Classification of Diseases 10th revision (ICD-10) criteria. Diagnosis was verified through consensus by two board-certified psychiatrists following a review of medical records. Exclusion criteria included: 1) comorbid organic brain diseases, other psychiatric disorders, or substance use disorders; 2) pregnancy or lactation; and 3) inability to cooperate with standardized assessments or blood sample collection.

2.2. Data Collection

Demographic and clinical information was systematically extracted from electronic medical records by two trained psychiatrists. Variables collected included age, marital status, educational level, occupation, family income, history of smoking and alcohol use, illness duration, sleep quality, and history of aggressive behavior. History of suicide attempts was ascertained from reports from both participants and their family members, which were cross-verified by researchers against treatment records and nursing notes. All data were further validated with inpatient admission records and psychiatric assessment documents to ensure accuracy.

Psychometric assessments were conducted within 72 hours of admission using the following standardized instruments: the Positive and Negative Syndrome Scale (PANSS) for psychotic symptoms, the Hamilton Depression Rating Scale (HAM-D-17) for depressive severity, and the Hamilton Anxiety Rating Scale (HAMA) for anxiety symptoms. All raters were certified in the application of these scales, and inter-rater reliability was established prior to the study.

Laboratory parameters were obtained from baseline blood samples collected at admission, including C-reactive protein (CRP), homocysteine, vitamin B12, thyroid-stimulating hormone (TSH), folic acid, cortisol, and erythrocyte sedimentation rate (ESR). Blood samples were processed in accordance with the hospital’s standard operating procedures, and results were recorded in the electronic medical record system.

2.2. Statistical Analysis

Data analyses were performed using STATA 16.0 (Stata Corp., College Station, TX, USA). Categorical variables were summarized as frequencies and percentages (%) and compared between groups using the chi-square test (or Fisher’s exact test for expected cell counts <5). Normally distributed continuous variables were reported as mean ± standard deviation (SD) and analyzed with independent samples t-tests, while non-normally distributed variables were presented as median (interquartile range [IQR]) and analyzed with the Mann-Whitney U test. A multivariate logistic regression model was constructed to identify independent risk factors, incorporating all variables with p<0.10 in univariate analyses. Results were reported as odds ratios (OR) with 95% confidence intervals (CIs). Statistical significance was set at p<0.05 for all tests.

3. Results

3.1. Sample Characteristics and Prevalence of Suicide Attempts

A total of 201 female inpatients with SCZ were included in the final analysis, with a mean age of 40.15 years (SD=11.77). Nearly half (45.77%) of them were single, and the majority (75.62%) had completed nine-year compulsory education, whereas only one-fourth had received college education or higher. Their median illness duration was 12.0 years (IQR: 5.0-20.0), with 28.86% of patients experiencing illness over 20 years. Regarding suicidal behaviors, 11.44% (23/201) of participants had attempted suicide within one month prior to admission, and 21.39% (43/201) reported a lifetime history of suicide attempts.

3.2. Risk Factors Associated with Recent Suicide Attempts

To identify factors associated with recent suicidal behaviors, we compared 23 participants with recent suicide attempts (RSA group) and 178 participants without recent suicide attempts (NRSA group; see Table 1). Participants in the RSA group had significantly higher rates of previous suicide attempts (56.52% vs. 11.24%, p<0.001), a higher proportion of them with delusions of being controlled (39.13% vs. 13.48%, p=0.002), and scored higher in HAMA than those in the NRSA group [5 (0,14) vs. 0 (0,4), p=0.003]. The intergroup difference in PANSS total scores approached statistical significance, with higher scores in the RSA group (78.22±19.68 vs. 69.93±20.43, p=0.068). The multivariable logistic regression model revealed with previous suicide attempts (OR=6.45, 95% CI: 2.27–18.34, p<0.001), with delusions of being controlled (OR=4.60, 95% CI: 1.46–14.52, p=0.009) and HAMA score (OR=1.15, 95% CI: 1.06–1.26, p=0.001) were independent risk factors for recent suicide attempts.

Table 1. a. Demographic and Clinical Characteristics of Patients with vs. without Recent Suicide Attempts (RSA)*. **b.** Laboratory Indicators of Patients with vs. without Recent Suicide Attempts.

a			
Characteristics	RSA (n=23)	NRSA (n=178)	P-value
Demographic characteristics			
Age (years, mean ± SD)	38.65±11.17	40.34±11.86	0.518
Marital Status [married: n(%)]	8(34.78)	59(33.15)	0.875

Childbirth History: n(%)	7(30.43)	69(38.76)	0.438
Educational attainment [More than 9 years: n(%)]	16(69.57)	136(76.40)	0.506
Occupation [unemployment: n(%)]	14(60.87)	133(74.72)	0.159
High household socioeconomic status [‡] : n(%)	9(39.13)	60(33.71)	0.432
Smoking History: n(%)	0	15(8.43)	0.148
Alcohol Use History: n(%)	2(8.70)	8(4.49)	0.383
Good social skills ^{&} : n(%)	5(21.74)	21(11.80)	0.157
<i>Clinical characteristics</i>			
Duration of illness (years, mean ± SD)	13.30±9.44	14.01 ± 10.33	0.753
With auditory hallucinations: n(%)	21(91.30)	163(91.57)	0.965
With delusions of control: n(%)	9(39.13)	24(13.48)	0.002
With prominent negative symptoms: n(%)	19(82.61)	162(91.01)	0.205
Previous suicide attempts: n(%)	13(56.52)	20(11.24)	<0.001
PANSS total score (mean±SD)	78.22±19.68	69.93±20.43	0.068
HAMD Score: Median (IQR)	9 (1, 15)	1 (1, 15)	0.210
HAMA Score: Median (IQR)	5 (0, 14)	0 (0, 4)	0.003

* Recent defined as within 1 month prior to admission. RSA: Patients with recent suicide attempts within one month prior to admission. NRSA: Patients without recent suicide attempts within one month prior to current admission. PANSS: Positive and Negative Syndrome Scale, HAMD: Hamilton Depression Scale, HAMA: Hamilton Anxiety Scale, IQR: interquartile range. [&] Social skills was an ordinal variable, reported by the participants' family members, and categorized into three levels: low, moderate, and good. [#] Household socioeconomic status was an ordinal variable, self-reported by the participants themselves, and categorized into three levels: low, moderate, and high.

b			
Indicators [Median (IQR)]	RSA (n=23)	NRSA (n=178)	P-value
CRP (mg/dl)	0.26 (0.15, 0.42)	0.23 (0.14, 0.43)	0.779
Hcy (umol/L)	12.6 (10.6, 17.3)	13.8 (11.3, 16.6)	0.533
Folic Acid (ng/ml)	6.6 (3.51, 12.54)	7.21 (4.59, 10.07)	0.933
Vit B12 (pg/ml)	381.7 (307.7, 544.9)	393.8 (306.7, 596)	0.968
ESR (mm/h)	4 (3, 10)	4 (2, 8)	0.392
TSH (mIU/L)	2.23 (1.31, 3.05)	1.82 (1.28, 2.58)	0.497
Cortisol (ug/dl, mean±SD)	15.52±5.58	16.07±6.28	0.689
CRP: C-recreative protein, Hcy: Homocysteine, Vit B12: Vitamin B12, ESR: Erythrocyte Sedimentation Rate, TSH: Thyroid-Stimulating Hormone.			

3.3. Risk Factors Associated with Lifetime Suicide Attempt History

For lifetime suicide attempt history, we compared 43 participants with a lifetime history of suicide attempts (HSA group) and 158 participants without a lifetime suicide attempt history (NHSA group; detailed in Table 2). The HSA group had a higher proportion of alcohol users (11.63% vs. 3.16%, $p=0.024$) and a higher rate of participants with good social skills (18.60% vs. 11.39%, $p=0.007$). Both PANSS total scores (79.93 ± 20.58 vs. 68.41 ± 19.80 , $p<0.001$) and HAMA scores [3 (0, 10) vs. 0 (0, 4); $p=0.018$] were significantly elevated in the HSA group. The HSA group exhibited a marginally significant lower rate of aggressive behavior (25.58% vs. 40.51%, $p=0.073$).

Table 2. a. Demographic and Clinical Characteristics of Patients with vs. without a History of Suicide Attempts. **b.** Laboratory Indicators of Patients with vs. without a History of Suicide Attempts.

a			
Characteristics	HSA (n=43)	NHSA (n=158)	P-value
Age (years, mean $\pm$ SD)	39.33 $\pm$ 10.92	40.37 $\pm$ 12.01	0.606
Marital Status [married: n(%)]	20(46.51)	47(29.75)	0.039
Childbirth History: n(%)	14(32.56)	62(39.24)	0.423
Educational attainment [More than 9 years: n(%)]	31(72.09)	121(76.58)	0.651
Occupation [unemployment: n(%)]	32(74.42)	115(72.78)	0.258
High household socioeconomic status: n(%)	9(20.93)	39(21.91)	0.870
Smoking History: n(%)	3(6.98)	12(7.59)	0.891
Alcohol Use History: n(%)	5(11.63)	5(3.16)	0.024
Good social skills: n(%)	8(18.60)	18(11.39)	0.007
Duration of illness (years, mean $\pm$ SD)	14.88 $\pm$ 9.76	13.67 $\pm$ 10.36	0.493
With aggressive behavior: n(%)	11(25.58)	64(40.51)	0.073
Good sleep quality: n(%)	13(30.23)	38(24.05)	0.356
PANSS total score (mean $\pm$ SD)	79.93 $\pm$ 20.58	68.41 $\pm$ 19.80	0.001
HAMD score: Median (IQR)	3 (1, 13)	1 (1, 15)	0.902
HAMA Score: Median (IQR)	3 (0, 10)	0 (0, 4)	0.018
HSA: Patients with a history of suicide attempts, NHSA: Patients without a history of suicide attempts. PANSS: Positive and Negative Syndrome Scale, HAMD: Hamilton Depression Scale, HAMA: Hamilton Anxiety Scale, IQR: interquartile range.			

b			
Indicators [Median (IQR)]	RSA (n=23)	NRSA (n=178)	P-value
CRP (mg/dl)	0.26 (0.15, 0.44)	0.23 (0.14, 0.42)	0.826
Hcy (umol/L)	12.6 (10.9, 17.4)	13.8 (11.3, 16.5)	0.677
Folic Acid (ng/ml)	7.17 (4.04, 12.00)	7.14 (4.59, 9.95)	0.489
Vit B12 (pg/ml)	381.7 (307.7, 611.7)	395.1 (306.7, 571.6)	0.912
ESR (mm/h)	4 (2, 6)	4 (2, 9)	0.854
TSH (mIU/L)	1.98 (1.31, 2.43)	1.87 (1.28, 2.67)	0.711
Cortisol (ug/dl, mean±SD)	15.93±5.29	16.03±6.43	0.924

In the multivariable logistic regression model (Table 3), after adjusting for potential confounders, being married (OR=2.17, 95% CI: 1.02–4.62, p=0.045), HAMA score (OR=1.11, 95% CI: 1.04–1.19, p=0.003), and PANSS total score (OR=1.02, 95% CI: 1.003–1.04, p=0.025) emerged as independent risk factors for lifetime suicide attempt history.

Table 3. Multivariable Logistic Regression Analysis of Risk Factors for Lifetime Suicide Attempt History.					
	OR	z	P-value	95% CI	
				Lower band	Upper band
Being married	2.17	2.00	0.045	1.02	4.62
HAMA score	1.11	2.97	0.003	1.04	1.19
PANSS total score	1.02	2.24	0.025	1.003	1.04
Good social skills	1.30	0.96	0.338	0.76	2.25
Alcohol use history	3.00	1.50	0.134	0.71	12.69

OR=Odds ratio. 95% CI=95% confidence interval.

4. Discussion

As a leading cause of unnatural death in schizophrenia, suicide demands urgent attention. This study provides critical evidence on this issue by focusing on a high-risk yet under-investigated population, female inpatients with schizophrenia. Our results demonstrated high prevalences of both recent and lifetime suicide attempts. The severity of overall psychosis and co-occurring anxiety were identified as central risk factors. Notably, the specific symptom of delusions of being controlled significantly heightened the risk of recent attempts. These findings highlight the necessity of implementing tailored suicide preventive interventions for women with schizophrenia, which emphasize the management of anxiety and key psychotic symptoms.

The prevalence of lifetime suicide attempts in our cohort aligned with the widely reported range of 20%-50% in individuals living with schizophrenia globally and in China [9,11]. More critically, we found that 11.44% of patients attempted suicide within one month prior to admission, indicating a sharp elevation of risk during periods of acute psychotic exacerbation. This heightened risk may be attributed to two mechanisms. First, severe psychotic experiences (e.g. command hallucinations) may directly precipitate suicidal behaviors [25]. Second, the intense psychological distress associated with comorbid affective symptoms during this phase is also a critical contributing factor [26]. Our findings reinforce that the inpatient setting as a crucial window for intervention. Beyond managing core

psychotic symptoms, it is imperative to integrate systematic suicide risk assessment and gender-tailored preventive measures into clinical care upon admission, especially for patients with previous suicide attempts.

Our analysis indicated that though the overall severity of psychotic symptoms, as measured by the PANSS total score, was not independently associated with recent suicide attempts, it did constitute a significant risk factor for lifetime suicide attempts. This suggests that while the cumulative burden of psychosis over the illness course confers long-term vulnerability to suicidal behavior [27], acute risk is likely driven by more specific and immediate factors [20]. Notably, we identified a significant association between delusions of being controlled and recent suicide attempts, which have not been fully investigated [28,29]. Although positive symptoms have been inconsistently linked to suicidal behavior in literature, possibly due to the heterogeneity of symptom constructs [20], delusions of being controlled has been theoretically linked to intense emotional distress and perceived helplessness [30]. Emerging framework suggests that psychotic experiences may exacerbate suicide risk through pathways including social isolation and loss of meaning [31]. Our findings underscore the importance of specifically assessing delusions of being controlled and other passivity experiences in risk evaluation among female inpatients with schizophrenia. Future studies with larger samples and transdiagnostic designs are warranted to validate this association and clarify its underlying mechanisms.

A key finding of our study is the independent association between anxiety and both recent and lifetime suicide attempts. This aligns with established evidence showing that comorbid anxiety substantially elevates suicide risk in schizophrenia [32–34]. Importantly, our results extend this understanding by demonstrating that even mild-to-moderate anxiety confers significant risk, highlighting anxiety as a critical transdiagnostic driver for suicidality in schizophrenia. The underlying mechanisms may be particularly salient for women. Gender-specific factors such as hormonal fluctuations [35], heightened stress sensitivity [36], and increased prevalence of trauma-related disorders [37] may amplify anxiety's impact in female patients [38]. Additionally, women with schizophrenia often face compounded psychosocial stressors, including caregiver responsibilities and societal stigma [39,40], which can create a vicious cycle of anxiety exacerbation. While evidence-based interventions for anxiety are widely available [41–43], they remain significantly underutilized in the routine care of schizophrenia [44]. The development and implementation of integrated protocols address anxiety in women with schizophrenia represent a promising direction for enhancing suicide prevention. Future research should focus on adapting existing interventions for this population and testing their efficacy through randomized controlled trials.

Regarding demographic and psychosocial factors, being married emerged as an independent risk factor for lifetime suicide attempts, which reflected the conflicting evidence in the literature [45–47]. Our finding may be explained by the substantial relational and caregiving burdens borne by women within family structures, which, when compounded by schizophrenia, can intensify feelings of entrapment and perceived burden to others [15,48]. We also observed that alcohol use and better social skills were associated with lifetime suicide attempts, though not retained in the multivariate model. While alcohol may facilitate suicidal behavior through disinhibition and serve as a maladaptive coping strategy [49,50], preserved social skills could heighten sensitivity to stigma or interpersonal distress [51]. These preliminary observations underscore complex psychosocial pathways to suicide in women with schizophrenia, which need further validation in well-designed cohort studies.

5. Conclusions

This study provides clinically relevant insights into suicide risk among female inpatients with schizophrenia. We identified high prevalences of both recent and lifetime suicide attempts in this understudied population, driven primarily by clinical rather than demographic factors. Specifically, delusions of being controlled predicted recent attempts, while anxiety and overall psychosis severity

independently contributed to lifetime risk. These findings support the implementation of routine assessment for these specific symptoms to improve suicide prevention in this vulnerable population. Future longitudinal studies are warranted to validate these relationships and clarify underlying mechanisms.

6. Limitations

Several limitations should be considered when interpreting the results. First, the cross-sectional design precluded causal inference between the identified factors and suicide attempts. Data on suicidal behavior was collected retrospectively through self-report and family accounts, which were subject to recall bias and lacked the de-tailed characterization regarding intent, method, and context. Second, modest sample size limited statistical power for detecting less frequent associations and conducting stratification of variables such as smoking and alcohol use patterns, potentially curing other relevant risk factors. Third, although the focus on a homogeneous population enhanced internal validity, the single-center recruitment strategy might limit the generalizability of findings to other clinical settings or healthcare systems. Finally, the investigation of biomarkers was constrained by a single assessment at admission and a limited sample size, which limited our capacity to identify the detection of significant relationships. Future studies with longitudinal design and larger cohorts are needed to definitively evaluate their role in suicide risk.

Supplementary Materials: The following supporting information can be downloaded at the website of this paper posted on Preprints.org.

Author Contributions: Conceptualization, ML.A. and M.F.; methodology, ML.A.; software, TH.Z.; validation, YZ.N; formal analysis, ML.A., LL. Z.; investigation, ML. A., DQ. Y., Y. Z.; resources, YZ.N.; data curation, LL.Z., DQ. Y, Y. Z.; writing—original draft preparation, ML.A.; writing—review and editing, TH.Z., M. F.; visualization, ML.A.; supervision, M.F.; project administration, YZ.N., M. F.; funding acquisition, YZ.N., TH. Z. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of Beijing Anding Hospital (2023325FS-2; approval obtained on 7 December 2023).

Informed Consent Statement: Written informed consent was obtained from all participants prior to data collection.

Data Availability Statement: In justified cases, the corresponding author may send the source data included in this paper.

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Abbreviations

The following abbreviations are used in this manuscript:

SCZ	Schizophrenia
ICD-10	International Classification of Diseases 10th revision
PANSS	Positive and Negative Syndrome Scale
HAMD	Hamilton Depression Scale
HAMA	Hamilton Anxiety Scale
CRP	C-reactive protein
TSH	Thyroid-stimulating hormone

ESR	Erythrocyte sedimentation rate
IQR	Interquartile range
OR	Odds ratio
RSA	Patients with recent suicide attempts within one month prior to admission
NRSA	Patients without recent suicide attempts within one month prior to admission
HSA	Patients with a history of suicide attempts
NHSA	Patients without a history of suicide attempts

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