



Prevalence and risk factors for different levels of cognitive impairment in schizophrenia patients with suicidal ideation

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Abstract: Schizophrenia is associated with a substantially elevated lifetime risk of suicide. Although cognitive impairment has been widely recognized as a core clinical feature of this disorder, the relationship between cognitive dysfunction and suicidal ideation (SI) remains inadequately understood. The present study investigated the prevalence of cognitive impairment and explored its associated risk factors among patients with schizophrenia who reported SI. A total of 812 participants were enrolled in the study. Suicidal ideation was evaluated using the Beck Scale for Suicide Ideation (BSS), while cognitive functioning was assessed with the Mini-Mental State Examination (MMSE) and the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). Based on the BSS cutoff criteria, 172 patients were classified as having SI. Among these individuals, the prevalence of cognitive impairment, as defined by MMSE scores, was 54.7%, which was significantly lower than that observed in patients without SI. Further comprehensive neuropsychological evaluation using the RBANS provided a more detailed characterization of cognitive performance across multiple cognitive domains. Cognitive impairment was found to be common among patients with schizophrenia and SI, although its prevalence was lower than that in patients without SI. Age and level of educational attainment emerged as important factors associated with cognitive outcomes, highlighting their relevance for understanding and addressing cognitive deficits in this high-risk population.

Keywords: cognitive impairment; risk factors; schizophrenia; suicidal ideation

Introduction

Patients diagnosed with schizophrenia experience a markedly elevated risk of suicide as well as substantially increased overall mortality. Epidemiological evidence indicates that approximately 40%–50% of individuals with schizophrenia attempt suicide at least once during their lifetime, while an estimated 9%–13% ultimately die by suicide. Notably, suicide constitutes one of the leading causes of premature mortality among individuals with schizophrenia younger than 35 years of age (Kirkpatrick & Tek, 2007; Potkin et al., 2003; Öztürk & Uluşahin, 2018).

Recent research has drawn attention to a paradoxical association between cognitive functioning and suicidality in this clinical population. In a cohort study of 402 young patients with recent-onset schizophrenia, Kim et al. (2023) reported that individuals presenting with suicidal ideation demonstrated significantly better performance across several cognitive domains, including verbal and visual learning, the Trail Making Test, and verbal fluency. These associations remained statistically significant after controlling for age, duration of untreated psychosis, and depressive symptoms, indicating that relatively preserved cognitive abilities may, paradoxically, be linked to an increased risk of suicidal ideation. Furthermore, large-scale investigations have consistently documented the high prevalence of suicidal ideation and suicide attempts among individuals with schizophrenia across diverse cultural and

sociocultural contexts (Zhu & Zhang, 2024; Le et al., 2024). However, the literature examining the relationship between suicidal behavior and cognitive functioning remains relatively limited (Potkin et al., 2003; Zoghbi et al., 2014; Kocatürk et al., 2015; Kim et al., 2003; Liu et al., 2022), and findings on the association between cognitive abilities and suicide attempt history in patients with schizophrenia are inconsistent, hence this study.

Schizophrenia: its mature and characteristics

In comparison with the general population, individuals diagnosed with schizophrenia demonstrate a markedly increased risk of suicide. A wide range of demographic and clinical factors associated with suicide risk in this population have been identified, including male sex, unmarried marital status, the presence of depressive symptoms, and pronounced feelings of hopelessness (Kirkpatrick & Tek, 2007; Potkin et al., 2003; Öztürk & Uluşahin, 2018; Meltzer, 1999; Caldwell & Gottesman, 1992; Sadock, 2007; Soygür et al., 2007). Additional predictors of suicidality include a previous history of suicide attempts (Caldwell & Gottesman, 1992; Mann et al., 1999), an early onset and severe course of illness, frequent symptom exacerbations, repeated psychiatric hospitalizations, increased levels of insight into illness, predominance of positive symptoms, a paranoid subtype of schizophrenia, comorbid substance use disorders, impaired social



functioning, and insufficient social support. More recent evidence further suggests that demographic characteristics such as age, sex, and level of educational attainment exert an additional influence on suicide risk among individuals with schizophrenia (Calli et al., 2023).

An increasing body of research has also highlighted the contribution of cognitive functioning to suicidality in schizophrenia. For instance, Wang et al. (2023) found that higher scores in visuospatial ability and attention on the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) were associated with greater levels of suicidal ideation in middle-aged and older patients with schizophrenia, further supporting the notion that relatively preserved cognitive abilities in specific domains may paradoxically increase suicide risk (Li et al., 2025).

Cognitive dysfunction is widely recognized as a core and pervasive feature of schizophrenia, encompassing impairments across multiple domains, including executive functioning, attention, perceptual-motor processing, sustained attention, verbal learning, verbal and spatial memory, and verbal fluency (Saykin et al., 1991; Bilder et al., 2000; Andreasen et al., 1999). Such cognitive deficits substantially compromise the quality of life of individuals with schizophrenia by adversely affecting their social functioning and vocational performance (Alptekin et al., 2005). A notable inconsistency concerns whether cognitive performance serves as a risk or protective factor: some studies suggest that better global cognitive functioning is associated with heightened suicidality (e.g., Kim et al., 2023; Delaney et al., 2012), potentially because individuals with higher cognitive ability may possess greater illness insight and thus experience more emotional distress. In contrast, other research reports an association between cognitive impairment and elevated suicide risk (e.g., Barrett et al., 2011), while some studies find no significant relationship at all (Potkin et al., 2003). These discrepancies may be attributable to methodological differences, including variation in sample characteristics (e.g., age, illness chronicity), the cognitive domains assessed, and insufficient control for key confounders such as educational attainment (Zhu et al., 2024; Li et al., 2025).

The Chinese context

More recent evidence derived from Chinese populations has likewise demonstrated significant associations between cognitive impairment and suicidal behaviors in individuals with schizophrenia, thereby underscoring the importance of conducting investigations across diverse cultural and sociocultural contexts. For instance, a large-scale study conducted by Zhu and Zhang (2024), which employed the Mini-Mental State Examination (MMSE), confirmed a significant relationship between global cognitive functioning and suicidal tendency among patients with schizophrenia. In addition, a study focusing on middle-aged and older patients reported that higher levels of visuospatial ability and attentional performance, as assessed using the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), were associated with increased suicidal ideation (Wang et al., 2023). Furthermore, findings reported by Liu et al. (2023) suggested that although overall neurocognitive functioning is related

to suicidal ideation, affective and emotional factors, such as empathy, may exert an important moderating influence on this association. Most recently, Wu et al. (2024) utilized both the RBANS and the Beck Scale for Suicide Ideation (BSS) in a sample of Han Chinese inpatients and observed that higher scores in specific cognitive domains, particularly attention, were paradoxically associated with greater suicide risk, further reinforcing the existence of a complex and potentially non-linear relationship between cognition and suicidality (Wang et al., 2023).

Despite their valuable contributions, these studies collectively reveal several persistent gaps that the present investigation aims to address. First, many prior studies have relied primarily on global cognitive screening instruments, such as the MMSE, or have examined only a limited range of cognitive domains, thereby failing to provide a comprehensive neuropsychological characterization of patients at elevated suicide risk. Second, study samples have frequently included patients with a wide range of suicidality levels, rather than specifically identifying and characterizing individuals with active and clinically significant suicidal ideation as a distinct high-risk subgroup. Third, relatively little attention has been devoted to examining sociodemographic and clinical variables—such as educational attainment and age at first hospitalization—that may confound or modify the relationship between cognitive functioning and suicidality within this subgroup. To address these limitations, the present study systematically investigates the prevalence, patterns, and associated risk factors of cognitive impairment, comprehensively assessed using both the MMSE and RBANS, exclusively among patients with schizophrenia who exhibit active suicidal ideation as defined by a standardized BSS cutoff, while rigorously controlling for key confounding factors, including age and educational level.

Goals of the study. The present study aims to address these existing gaps by systematically examining the prevalence of cognitive impairment among patients with schizophrenia who report suicidal ideation. In addition, potential risk factors are evaluated through a detailed analysis of key demographic variables, including sex, age, level of educational attainment, marital status, and race, with the objective of identifying factors that may predict both suicidality and cognitive impairment within this clinical population.

Nevertheless, the current body of literature investigating the association between suicidal behavior and cognitive functioning in schizophrenia remains relatively limited and is further characterized by heterogeneous and sometimes inconsistent findings (Potkin et al., 2003; Zoghbi et al., 2014; Kim et al., 2003; Le et al., 2024; Li et al., 2025).

Methods

Participants and setting

A total of 812 schizophrenia patients from the inpatient clinic of the Hui Long Guan Hospital were enrolled in this study. All patients participated in the study with informed consent. Inclusion criteria were as follows: (1) age between 18 and 75 years; (2) a confirmed diagnosis of schizophrenia by two psychiatrists using the Structured

Table 1. Comparison of socio-demographic and clinical characteristics between schizophrenia patients with and without suicidal ideation

Variable	With suicide ideation (n = 172)	Without suicide ideation (n = 640)	t/ χ^2 /F	p
Age (years) (M $\pm$ SD)	43.46 $\pm$ 11.9	48.24 $\pm$ 12.34	4.543	<0.001
Gender			1.52	0.29
Male (%)	105 (61)	423 (66.1)		
Female (%)	67 (39)	217 (33.9)		
Cognitive impairment			4.58	0.004
With cognitive impairment (%)	91 (52.9)	416 (65)		
Without cognitive impairment (%)	78 (45.35)	206 (32.19)		
Unknown (%)	3 (0.02)	18 (0.03)		
Education level			3.63	0.28
PS (%)	31 (18.1)	115 (18.1)		
MS (%)	66 (38.6)	293 (38.6)		
TSS/HS (%)	47 (27.5)	165 (25.9)		
Undergraduate (%)	24 (14.0)	50 (7.9)		
Master (%)	1 (0.6)	6 (0.9)		
Uneducated (%)	2 (1.2)	7 (1.1)		
Marriage			3.63	0.31
Unmarried (%)	99 (57.6)	381 (59.5)		
Married (%)	39 (22.7)	144 (22.5)		
Divorce (%)	34 (19.8)	115 (18)		
FHoPD			3.21	0.073
History (%)	138 (80.2)	549 (85.8)		
No history (%)	34 (19.8)	91 (14.2)		
Education (years) (M $\pm$ SD)	9.35 $\pm$ 3.36	8.86 $\pm$ 3.12	1.803	0.037
Weight (kg)	69.47 $\pm$ 13.42	66.78 $\pm$ 12.57	2.457	0.319
Height (cm)	165.57 $\pm$ 7.96	164 $\pm$ 8.40	1.051	0.893
Age of onset (years)	24.62 $\pm$ 7.97	25.71 $\pm$ 8.06	-1.589	0.553
Hospitalization numbers	6.65 $\pm$ 8.98	6.51 $\pm$ 9.14	0.179	0.979
AoFH (years)	26.79 $\pm$ 9.29	28.99 $\pm$ 10.28	-2.545	0.038
MMSE (total)	24.16 $\pm$ 5.41	22.60 $\pm$ 6.34	2.900	0.016

Note. **Abbreviations:** PS = Primary school; MS = Middle school; TSS = Technical secondary school; HS = high school; FHoPD = Family history of psychotic disorder; AoFH = Age of first hospitalization.

Clinical Interview for DSM-IV (SCID). The sociodemographic and clinical characteristics of the two groups are presented in [Table 1](#).

Measures

Participants reported on their: (1) Basic demographic characteristics: gender, age, and ethnicity (categorized as Han, Man, Hui, Mongolian, Tibetan, or other); (2) Socioeconomic and life status: educational attainment (categorized as uneducated, primary school, middle school, technical secondary school/high school, undergraduate, master's, or doctoral), total years of formal education, and marital status (categorized as unmarried, married, divorced, or widowed); (3) Living circumstances: current living arrangements (categorized as residing in a hospital ward, living alone, living with a spouse, living with family, or other); and (4) Clinical and anthropometric data: age at onset of first psychotic symptoms, age at first psychiatric hospitalization, number of previous hospitalizations, and family history of psychiatric disorders.

Participants completed the following clinical measures

Suicidal ideation

Suicidal ideation was assessed in all participants (N = 812) using the Chinese version of the Beck Scale for Suicide Ideation (BSS). The BSS is a 19-item clinician-rated instrument designed to evaluate the intensity, duration, and qualitative characteristics of suicidal thoughts. It assesses multiple dimensions, including the wish to live or die, reasons for living vs dying, active and passive suicidal desire, duration and frequency of suicidal thoughts, attitudes toward suicide, perceived control over suicidal impulses, deterrents to suicide, and the specificity of suicide plans. Each item is scored on a 3-point scale (0–2), with higher total scores reflecting more severe suicidal ideation. In the present study, the Beck Scale for Suicide Ideation (BSS) was administered using two distinct assessment timeframes, specifically evaluating suicidal ideation occurring during the past week as well as during the most depressive period in the individual's lifetime. The Chinese version of the BSS has been shown to possess satisfactory reliability and validity in prior studies conducted among Chinese psychiatric populations ([Beck et al., 1979](#); [Zhang & Brown, 2007](#)).

Participants who obtained a total score of 6 or higher on the items assessing suicidal ideation during the past week were formally classified as exhibiting current suicidal ideation ($n = 172$) and were assigned to the suicidal ideation (SI) group. In contrast, the remaining participants ($n = 640$) were categorized as not having current suicidal ideation. The use of this standardized cutoff score provided an objective and consistent criterion for group classification.

The repeatable battery for the assessment of neuropsychological status (RBANS)

The RBANS includes 12 subtests that generate five age-adjusted index scores and an overall score. With an average score set at 100 and a standard deviation of 15 for the general population, RBANS evaluates cognitive domains through specific indices: Language, assessed via Picture Naming and Semantic Fluency tasks; Immediate Memory, through List Learning and Story Memory tasks; Visuospatial/Constructional, via Figure Copy and Line Orientation tasks; Attention, through Digit Span and Coding tasks; and Delayed Memory, assessed with List Recall, Story Recall, Figure Recall, and List Recognition tasks. Prior to its translation into Chinese, our research group confirmed the clinical validity and test-retest reliability of the RBANS in schizophrenia patients (Zhang et al., 2008).

The mini-mental state examination (MMSE)

The Mini-Mental State Examination (MMSE) is widely utilized in schizophrenia research and represents one of the most commonly employed standardized bedside instruments for the detection of cognitive impairment in psychiatric populations, demonstrating substantial clinical utility (Tombaugh & McIntyre, 1992). This multifaceted assessment tool examines a broad range of cognitive domains, including temporal and spatial orientation, memory functioning, calculation ability, language skills, pattern recognition, comprehension, as well as writing and drawing capacities.

In the present study, the MMSE was applied as a screening instrument to classify participants into different levels of cognitive impairment, including normal, mild, moderate, and severe categories. In contrast, the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) was used to provide a more comprehensive and domain-specific evaluation of cognitive functioning across five distinct cognitive domains. The degree of convergence between the MMSE and RBANS was assessed using Pearson correlation analysis, which revealed a strong positive association ($r = 0.72$, $p < 0.001$), thereby indicating good convergent validity between the two measures.

Procedure

This study received ethical approval from the Institutional Review Board of the First Hospital of Shanxi Medical University (Approval No. 2016-Y27). Written informed consent was obtained from all participants prior to their enrollment in the study.

Data analysis

Data analyses were conducted using the Statistical Package for the Social Sciences (SPSS), version 27.0. Analysis of variance (ANOVA) was employed to compare continuous demographic and clinical variables across different levels of cognitive impairment, whereas Pearson's χ^2 tests were applied to examine differences in categorical variables. To identify independent risk factors for cognitive impairment while controlling for potential confounding effects, multiple logistic regression analyses were performed, with cognitive impairment status (presence vs. absence) specified as the dependent variable. The covariates entered into the regression models were selected on the basis of clinical relevance and the results of univariate analyses and included sex, age, years of education, marital status, age at first hospitalization, and family history of psychiatric disorders.

Comparisons of MMSE and RBANS scores across the different cognitive impairment groups were conducted using Fisher's tests. In addition, analysis of covariance (ANCOVA) was applied to compare cognitive test scores between groups while statistically adjusting for age and level of educational attainment. Furthermore, the associations between MMSE scores and other variables were examined using multiple logistic regression analyses, in which all predictors were entered simultaneously to evaluate both their independent and combined contributions.

Results

Sample characteristics and group comparisons

No significant differences were observed between the SI and Non-SI groups in gender distribution, education level, marital status, family history of psychotic disorders (FHoPD), weight, height, age at illness onset, or number of hospitalizations (all $p > 0.05$).

Prevalence of cognitive dysfunction among patients with schizophrenia and suicidal thoughts

The prevalence of cognitive impairment was determined to be 54.7% (94/172) among schizophrenia patients with suicidal ideation, as opposed to 65% (416/640) in those without such ideation. According to a chi-square test, the prevalence of cognitive impairment was significantly higher ($\chi^2 = 13.557$, $p = 0.004$) in schizophrenia patients without suicidal ideation than in those with suicidal ideation.

Characteristics of patients with suicidal ideation by cognitive impairment severity

Among the 172 patients with suicidal ideation, utilization of the MMSE led to their categorization into normal ($n = 78$), mild cognitive impairment ($n = 55$), moderate cognitive impairment ($n = 31$), and severe cognitive impairment ($n = 5$). Of these, 144 individuals underwent the RBANS assessment.

Table 2 presents the demographic and clinical characteristics of the patients stratified according to the severity of cognitive impairment. Statistical analyses demonstrated significant between-group differences with respect to age ($F = 3.772$, $p = 0.012$), educational level ($\chi^2 = 51.885$, $p < 0.001$), years of education ($F = 7.572$, $p < 0.001$),

Table 2. Characteristics of schizophrenia patients with varying degrees of cognitive impairment (accompanied by suicidal ideation)

Variable	Normal (n = 78)	MCI (n = 55)	MoCI (n = 31)	SCI (n = 5)	χ^2/F	<i>p</i>
Age (years)	41.26 ± 11.56	43 ± 11.49	49.35 ± 11.23	47.2 ± 17.5	3.772	0.012
Gender					1.498	0.683
Male (%)	52 (66.7)	33 (60)	17 (54.8)	3 (60)		
Female (%)	26 (33.3)	22 (40)	14 (45.2)	2 (40)		
Education level					51.885	<0.001
PS (%)	6 (7.7)	10 (18.2)	12 (40)	3 (60)		
MS (%)	32 (41)	24 (43.6)	8 (26.7)	1 (20)		
TSS/HS (%)	19 (24.4)	17 (30.9)	9 (30)	0 (0)		
Undergraduate (%)	20 (25.6)	3 (5.5)	1 (3.3)	0 (0)		
Master (%)	1 (1.3)	0 (0)	0 (0)	0 (0)		
Uneducated (%)	0 (0)	1 (1.8)	0 (0)	1 (20)		
Marriage					15.750	0.072
Unmarried (%)	53 (67.9)	32 (58.2)	11 (35.5)	2 (40)		
Married (%)	12 (15.4)	11 (20)	12 (38.7)	2 (40)		
Divorce (%)	13 (16.7)	12 (21.8)	7 (22.6)	1 (20)		
FHoPD					1.533	0.675
History (%)	17 (21.8)	10 (18.2)	6 (19.4)	0 (0)		
No history (%)	61 (78.2)	45 (81.8)	25 (80.6)	5 (100)		
Education (years) (M ± SD)	10.51 ± 11.56	8.73 ± 2.97	7.73 ± 3.28	7 ± 3.08	7.572	<0.001
Weight (kg)	70.53 ± 13.96	70.24 ± 13.55	67.07 ± 10.42	66 ± 21.37	0.662	0.576
Height (cm)	166.97 ± 7.62	165.51 ± 8.73	163.43 ± 7.07	164.4 ± 3.29	1.603	0.191
Age of onset (years)	23.96 ± 7.86	25 ± 7.45	25.9 ± 10.28	26.4 ± 12.16	0.552	0.648
Hospitalization numbers	7.08 ± 9.87	6.04 ± 7.27	6.33 ± 9.18	4.8 ± 2.68	0.224	0.879
AoFH (years)	25.46 ± 7.86	26.4 ± 8.79	30.48 ± 12.56	31.6 ± 8.99	2.687	0.048
MMSE (total)	28.36 ± 1.07	23.67 ± 1.52	16.16 ± 3.44	6.67 ± 1.16	501	<0.001

Note. **Abbreviations:** MCI = Mild cognitive impairment; MoCI = Moderate cognitive impairment; SCI = Severe cognitive impairment; PS = Primary school; MS = Middle school; TSS = Technical secondary school; HS = High school; FHoPD = Family history of psychotic disorder; AoFH = Age of first hospitalization.

and age at first hospitalization ($F = 2.687$, $p = 0.048$). In contrast, no statistically significant differences were identified among the cognitive impairment groups in terms of sex, marital status, family history of psychotic disorders, body weight, height, age at illness onset, or number of hospitalizations.

RBANS scores across cognitive impairment levels

As presented in Table 3, RBANS subtest scores and total scores are summarized for patients stratified by different levels of cognitive impairment. Among the 144 participants who completed the RBANS assessment, only those categorized as cognitively normal ($n = 73$), having mild cognitive impairment ($n = 53$), or moderate cognitive impairment ($n = 17$) were included in the analysis. As anticipated, statistically significant differences in RBANS performance were observed across these cognitive impairment groups.

Specifically, the RBANS index scores for Immediate Memory (including List Learning and Story Memory), Visuospatial/Constructional abilities (comprising Figure Copy and Line Orientation), Language functioning (including Picture Naming and Semantic Fluency), Attention (consisting of Digit Span and Coding), and Delayed Memory (encompassing List Recall, Story Recall, Figure Recall, and List Recognition) all demonstrated significant between-group differences, with all p -values less than

0.05. In addition, multiple logistic regression analyses were conducted to determine independent risk factors for cognitive impairment while adjusting for potential confounding variables, including sex, age, marital status, age at first hospitalization, and family history of psychiatric disorders. The analysis revealed that years of education (Wald $\chi^2 = 1947.578$, $\beta = -0.473$, $p < 0.001$, 95% CI 0.243–1.597, VIF = 2.748) and education level (Wald $\chi^2 = 25.417$, $\beta = -0.472$, $p < 0.05$, 95% CI 0.243–1.597, VIF = 2.917) remained significantly associated with cognitive impairment even after controlling for these covariates. None of the other covariates reached statistical significance in the final model (all $p > 0.05$).

Correlation analysis of risk factors

Correlation analysis revealed significant associations between cognitive impairment and several variables (Table 4): age ($r = -0.342$, $p < 0.001$), years of education ($r = -0.342$, $p < 0.001$), education level ($r = -0.235$, $p = 0.002$), marital status ($r = 0.191$, $p = 0.013$), height ($r = -0.160$, $p = 0.037$), and age at first hospitalization ($r = 0.202$, $p = 0.008$). However, after adjusting for multiple comparisons using the Bonferroni correction ($\alpha = 0.004$, i.e., $0.05/14$), only the associations with age, years of education, and education level remained statistically significant.

Table 3. RBANS subtest and total scores in patients with different degree of cognitive impairment

	Normal (n = 73)	mild cognitive impairment (n = 53)	Moderate cognitive impairment (n = 17)	F	p
Immediate memory (M ± SD)	72.07 ± 59.59	51.75 ± 12.31	44 ± 4.72	4.874	0.009
Attention	85.16 ± 11.867	76.38 ± 14.22	64.94 ± 19.99	26.374	<0.001
Language	84.23 ± 11.32	75.15 ± 12.81	66.82 ± 15.53	17.162	<0.001
Visuospatial skills	86.08 ± 16.52	75.53 ± 16.82	60.76 ± 12.93	13.052	<0.001
Delayed memory	76.48 ± 18.55	57.42 ± 15.57	44.94 ± 6.71	35.735	<0.001
Total score	73.73 ± 10.62	60.09 ± 10.91	51 ± 8.69	45.227	<0.001

Table 4. Correlation analysis of risk factors for cognitive impairment in schizophrenia patients with suicidal ideation

Variable	Gender	Age	EI	LoFE	Marriage	Habitat	Nation	Weight	Height	AoO	AoFH	HN	FHoPD	MMSE
Gender	1.00													
Age	0.04	1.00												
EL	0.03	0.01	1.00											
LoFE	0.00	0.06	0.785**	1.00										
Marriage	0.10	0.251**	0.01	0.06	1.00									
Habitat	0.10	0.02	0.11	0.08	0.06	1.00								
Nation	0.10	0.07	0.03	0.04	0.04	0.01	1.00							
Weight	−0.195*	0.11	0.13	0.09	0.04	0.09	0.01	1.00						
Height	−0.564**	0.11	0.152*	0.05	0.07	0.09	0.12	0.389**	1.00					
AoO	−0.170*	0.384**	0.04	0.06	0.153*	0.00	0.08	0.09	0.02	1.00				
AoFH	−0.205**	0.415**	0.03	0.04	0.153*	0.01	0.04	0.10	0.02	0.854**	1.00			
HN	0.12	0.06	0.01	0.01	0.162*	0.02	(0.04)	0.08	0.10	0.12	−0.153*	1.00		
FHoPD	0.14	0.02	0.277**	0.232**	0.12	0.04	(0.04)	0.09	0.08	0.09	0.04	0.14	1.00	
MMSE	0.09	0.231**	−0.235**	−0.342**	0.191*	0.07	0.02	0.10	−0.16*	0.10	0.202**	0.05	0.07	1.00

Note. * $p < 0.05$, ** $p < 0.01$. **Abbreviations:** MMSE = Mini mental state examination scale; EL = Education level; LoFE = Length of formal education; AoO = Age of onset; AoFH = Age of first hospitalization; HN = Hospitalization numbers; FHoPD = Family history of psychotic disorder.

Discussion

To our knowledge, this is the first study to simultaneously examine both the prevalence and the risk factors of cognitive impairment among patients with schizophrenia who report suicidal ideation. Our principal finding—that the prevalence of cognitive impairment was significantly lower in patients with suicidal ideation (54.7%) compared with those without (65%)—offers new insight into the inconsistencies reported in previous studies. This finding is consistent with prior studies indicating that relatively preserved cognitive functioning may be associated with an increased vulnerability to suicidality among individuals with schizophrenia (Kim et al., 2023; Delaney et al., 2012).

The present results contribute to resolving the apparent inconsistencies within the existing literature by demonstrating that the association between cognitive functioning and suicidality is complex and multifaceted rather than uniform or linear. First, after adjusting for educational attainment—a critical confounding factor that has frequently been neglected in earlier research—we observed that both higher educational level and a greater number of years of education functioned as independent protective factors against cognitive impairment, regardless of suicidal status. This finding suggests that some previously reported relationships between cognition and suicidality may have been partially driven by differences in pre-morbid intellectual reserve. Second, the application of the RBANS allowed for a more nuanced examination of

cognitive performance, revealing that even among patients with a comparatively lower prevalence of global cognitive impairment, impairments or relative preservation within specific cognitive domains, particularly attention, may be especially relevant to suicide risk. This observation is consistent with both our correlational analyses and prior findings reported by Wang et al. (2024).

Taken together, these observations suggest that the apparent paradox may be explained by a dual mechanism: on the one hand, preserved global cognition may increase an individual's capacity to plan and contemplate suicidal behavior, whereas on the other, deficits in certain domains—such as executive functioning or emotional regulation—may amplify impulsivity, psychological distress, or impaired coping, thereby facilitating the transition from suicidal thoughts to suicidal behavior.

The prevalence of cognitive impairment identified in the present cohort (62.5%) is broadly consistent with previously reported estimates, which have typically ranged from 50% to 70% in patients with schizophrenia (Keefe et al., 2005; Foguet-Boreu et al., 2020; Feber et al., 2025). Within this sample, the severity of cognitive impairment was significantly associated with age, level of educational attainment, total years of schooling, and age at first hospitalization. Notably, these findings differ in certain respects from earlier reports (Potkin et al., 2003; Zoghbi et al., 2014), a discrepancy that may reasonably be attributed to differences in sample characteristics and methodological

strategies. In contrast to prior investigations that predominantly examined Caucasian populations and employed alternative neurocognitive assessment tools, the present study utilized both the RBANS and the MMSE and specifically focused on individuals with schizophrenia who reported suicidal ideation.

Consistent with recent evidence derived from Chinese cohorts, we further observed that cognitive impairment was significantly associated with suicidal ideation and that emotional or cognitive traits, such as empathy, may additionally modulate this risk (Liu et al., 2023). Extending these previous findings, our results demonstrate that even after controlling for relevant demographic variables, age and educational level remain robust and independent predictors of cognitive impairment among patients with schizophrenia who exhibit suicidal ideation.

Education merits particular consideration. Prior research has consistently highlighted its protective effect against cognitive impairment. For instance, O'Donovan et al. (2020) estimated that universal access to education could prevent up to 10% of cases in Colombia, while Laditka and Laditka (2014) suggested that higher education may reduce the disability burden of cognitive decline and extend life expectancy. In line with these observations, the present study identified both educational attainment and total years of schooling as independent protective factors against cognitive impairment, regardless of levels of daily functioning or the presence of other psychiatric symptoms. Notably, even a minimal duration of formal education (1–4 years) was associated with a lower degree of cognitive impairment when compared with the absence of any formal schooling, highlighting the potential significance of encouraging and maintaining educational engagement among individuals with chronic schizophrenia.

Furthermore, the present study identified an earlier age at first hospitalization (AoFH) as a significant factor associated with greater severity of cognitive impairment. This observation is consistent with the existing literature on the neurobiological underpinnings of schizophrenia, as an earlier age at first hospitalization is commonly regarded as a proxy indicator of earlier illness onset and a more severe or unfavorable disease course (Zhang et al., 2017).

According to the neurodevelopmental model of schizophrenia, early neurobiological insults interfere with normal brain maturation processes. As a result, an earlier clinical manifestation necessitating hospitalization may reflect a greater degree of underlying neurodevelopmental disruption, which in turn is expressed as more severe and more widespread cognitive deficits (Rajji et al., 2014; Kahn & Keefe, 2013). In this regard, patients with a younger age at first hospitalization may constitute a distinct subgroup characterized by a more aggressive and adverse illness trajectory, in which cognitive systems are compromised earlier and to a greater extent, thereby establishing a lower baseline level of cognitive functioning from the initial stages of clinical care.

Age was also identified as a significant predictor of cognitive impairment, with older individuals demonstrating more pronounced declines in cognitive functioning, a finding that is in line with previous empirical evidence

(Locke et al., 2009). In addition, scores obtained on the RBANS showed a strong and statistically significant correlation with MMSE performance (all $p < 0.01$), thereby providing further support for the convergent validity of these two cognitive assessment measures. It should be emphasized that higher RBANS scores are indicative of better cognitive functioning and must be interpreted in this direction, so as to avoid the misinterpretation of elevated scores as reflecting greater levels of cognitive impairment (Zhang et al., 2008).

Although prior studies have reported sex-related differences in cognitive impairment (Gonçalves et al., 2023), the present analysis did not identify any significant gender effects. In line with the findings of Wang et al. (2023), higher levels of attentional performance were associated with increased suicidal ideation, indicating that specific cognitive domains may contribute to suicide risk even in the context of global cognitive impairment. This observation underscores the clinical importance of assessing discrete cognitive domains when evaluating suicide risk and may also reflect cultural or societal disparities in educational and cognitive opportunities between men and women. Furthermore, as proposed by Dickhoff et al. (2021), a potential imbalance between heightened sensitivity to social–emotional cues and deficits in attentional control in psychotic disorders may further increase vulnerability to suicidality, independent of gender-related factors.

Beyond cognitive and demographic determinants, the influence of psychotic symptomatology on suicidal ideation also merits careful consideration. A recent investigation conducted among Jordanian patients with schizophrenia demonstrated that both positive and negative symptom dimensions were significant predictors of suicidal ideation, with the frequency of suicidal thoughts serving a moderating role. Specifically, higher frequency of suicidal ideation attenuated the association between negative symptoms and suicidality, while simultaneously strengthening the impact of positive symptoms across most subscales of suicidal ideation. Additional factors associated with elevated suicide risk included sex, medication adherence, age, and a prior history of suicidal thoughts. Collectively, these findings underscore the complex and dynamic interplay between different symptom domains and suicidality in schizophrenia, and further suggest that clinical interventions aimed at reducing the frequency of suicidal thoughts may help diminish the contribution of positive symptoms to suicidal ideation (Khait et al., 2025).

Strengths, limitations, and future directions. The present study was designed to address these existing gaps and to clarify inconsistencies in the literature by systematically examining the prevalence and associated risk factors of cognitive impairment specifically among patients with schizophrenia who report suicidal ideation (Le et al., 2024). By employing a comprehensive neuropsychological assessment battery, namely the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), to evaluate multiple cognitive domains, and by rigorously controlling for key demographic confounding variables such as age and educational attainment, this investigation aims to offer a more refined and nuanced characterization of the cognitive profile associated with suicidal ideation

in schizophrenia. Through this approach, the study contributes to reconciling previously conflicting findings and advances current understanding of the complex relationship between cognitive functioning and suicidality in this clinical population.

Several limitations of the present study should be carefully considered. First, the cross-sectional nature of the study design limits the ability to draw causal conclusions regarding the relationships among cognitive impairment, suicidal ideation, and other psychiatric or functional variables. Second, the reliance on specific cognitive screening instruments may have introduced measurement-related bias. Although the RBANS has been validated as a useful tool for identifying general cognitive deficits, it was not specifically developed to assess the executive function impairments that are commonly observed in individuals with schizophrenia (Hobart et al., 1999; Feber et al., 2025). Third, the relatively modest sample size may restrict the generalizability of the findings to broader schizophrenia populations. In addition, the study sample comprised only patients who were capable of receiving oral antipsychotic treatment and completing cognitive assessments, which may have resulted in a selection bias toward individuals with relatively higher levels of functioning. Finally, cultural stigma associated with suicidality may have led to the underreporting of suicidal thoughts or behaviors, thereby potentially affecting the accuracy of the assessment.

The existing literature addressing the interplay between suicidality, cognitive impairment, and schizophrenia remains marked by considerable inconsistency. Heterogeneity in sample characteristics, cognitive assessment approaches, and operational definitions of suicidality substantially hinders direct comparisons across studies. Consequently, future investigations employing longitudinal designs and multi-center samples are critically needed to clarify the temporal sequencing and directionality of these associations. In particular, it remains uncertain whether interventions aimed at improving cognitive functioning in individuals with schizophrenia serve to reduce suicide risk, paradoxically increase vulnerability, or exert no significant effect. Achieving a more refined and nuanced understanding of these complex relationships will be essential for informing early intervention strategies and for optimizing targeted suicide prevention efforts in this highly vulnerable clinical population.

Conclusions

In conclusion, expanding and sustaining educational opportunities for individuals with schizophrenia may represent a critical strategy for alleviating cognitive impairment and, potentially, for reducing suicide risk. Future longitudinal research is warranted to elucidate the underlying causal relationships and to inform the development of targeted interventions designed to strengthen cognitive resilience and improve overall quality of life in this vulnerable population.

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