

An Exploration of Depression and Aggression Among Patients with Schizophrenia in China Rural Community

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Purpose: In schizophrenia, aggressive conduct is frequent. And depressed mood can also contribute to the occurrence of aggressive behaviors. The aim of this study was to investigate the risk factors for the occurrence of aggression in stable schizophrenia patients in rural China, mainly to investigate the role of depressed mood in the occurrence of aggression in schizophrenia patients.

Patients and Methods: This is a cross-sectional study conducted in the townships surrounding Chaohu City, Anhui Province, China. Patients' depressive mood was evaluated using the PHQ-9 (The 9-item Patient Health Questionnaire). Patients' aggressiveness was evaluated using the Modified Overt Aggression Scale (MOAS). A score of ≥ 4 was used as a threshold and divided into aggressive and non-aggressive groups.

Results: This study comprised a total of 821 schizophrenia patients. Among them, the prevalence of having aggressive behavior was 18.8%. After correcting for confounders, logistic regression analysis showed that low education level (OR=0.470, 95% CI 0.254–0.870; $p=0.016$), living with family (OR=0.383, 95% CI 0.174–0.845; $p=0.017$) depressed mood (OR=1.147, 95% CI 1.112–1.184; $p<0.001$) was significantly associated with the risk of aggressive behavior in patients with schizophrenia. Multivariate linear regression indicated that higher levels of aggression were linked with lower levels of education and higher depressive mood.

Conclusion: This study suggests that aggression is more common in patients with stable schizophrenia, and lower levels of education and higher levels of depression are associated risk factors for its occurrence. Living alone may be helpful in reducing the likelihood of aggression.

Keywords: schizophrenia depression aggression Chinese

Introduction

With a slightly less than 1% lifetime prevalence, schizophrenia is a chronic and complicated mental condition with a heterogeneous genetic and neurobiological foundation that impacts the early stages of brain development.¹ However, the incidence varies by region, with the number of schizophrenics in China being higher in rural than in cities.² According to a recent study, rural China had a 0.37% prevalence of schizophrenia in 1990, 0.43% in 2000, and 0.50% in 2010.³ Moreover, patients living in rural areas have lower treatment compliance than urban patients, which makes the psychiatric symptoms of rural patients more significant as well.⁴

On the other hand, schizophrenic symptoms are diverse, and among the many symptoms, some patients present with aggressive behavior, which can manifest as agitation, impaired impulse control, and decreased social sensitivity. A recent meta-analysis involving 15 studies with 4855 patients showed that the prevalence of schizophrenia combined with aggressive behavior was about 33.3%.⁵ The prevalence of violent conduct among hospitalized patients ranged from

15.3% to 53.2%, according to another meta-analysis that included 19 studies and 3941 patients.⁶ Schizophrenia individuals with aggressive behaviors exhibit both physical and verbal violence, and these behaviors not only have an impact on the treatment of their illness, but their family members may also be subjected to varying degrees of aggression. A survey of patients' family members showed that about 77.4% of relatives suffered from varying degrees of verbal and physical aggression, and about the average respondent reported potentially significant levels of PTSD.⁷ In order to enable early intervention, the study of factors influencing the propensity for violence in schizophrenia patients can offer a clinical basis for anticipating aggression. Currently, several studies addressing factors influencing aggression in schizophrenia patients have found that the occurrence of aggression is mostly associated with substance use⁸, previous history of violence⁹, early age of onset, male, poor economic status¹⁰, presence of physical illness and severe positive symptoms¹¹ involuntary hospitalization¹² etc.

People with schizophrenia often have depressive symptoms, which can appear at nearly any stage of the disease¹³. Additionally, there is a link between depressive symptoms and aggressive conduct, with one study demonstrating that depressive symptoms can predict violent behavior in teenagers¹⁴. Another investigation into adolescent offenders revealed that those who experienced depressed symptoms also displayed higher levels of violence.¹⁵ Adults with major depressive disorder are estimated to have a prevalence of 58.7% of any aggressive outbursts, and depressed symptoms have a positive correlation with aggression.^{16,17} Aggression, however, has also been demonstrated to be connected with characteristics other than depressive symptoms rather than depression per se^{18,19}.

The majority of recent research on violence in schizophrenia patients has only examined inpatients and disregarded patients treated at home. Additionally, research on the connection between violent conduct and negative mood in schizophrenia patients is scarce. In order to ease the clinical application of early intervention, we comprehensively investigate in this work how violent behavior of schizophrenia patients treated at home is influenced by depressed mood.

Materials and Method

Participants

This is a cross-sectional study conducted around Chaohu City, Anhui Province, China from September to October 2022. The study population consisted of patients with severe mental disorders in the surrounding townships of Chaohu City, Anhui Province. Chinese Han patients who met the following criteria were recruited for this study: (1) Met the DSM-5 diagnostic criteria for schizophrenia. (2) Aged between 18 and 75 years old. (3) Less than 50% change in dose of any major psychotropic medication in the past three months. Exclude patients based on the following criteria: (1) Have other neurological or psychiatric disorders. (2) Age <18 years or >75 years. (3) Pregnancy or lactation. (4) History of psychoactive substance abuse.

Through a self-designed questionnaire, personal information including age, gender, BMI, education level, and marital status was gathered. Total duration of illness, age at onset, physical co-morbidities, and depression scores of patients with schizophrenia were collected through clinical interviews. This cross-sectional study enrolled 1205 individuals with schizophrenia, of whom 821 cases met the inclusion criteria. This investigation was approved by the Ethics Committee of Chaohu Hospital of Anhui Medical University(KYXM-202212-013). All patients signed an informed consent form before the survey to ensure that their privacy would not be disclosed.

Measures

Moas

We used the Modified Overt Aggression Scale (MOAS) to assess aggression. The scale contains four subscales: verbal aggression, property aggression, self-aggression, and aggression toward others. Each individual's score on each subscale ranged from 0 (no aggression) to 4 (highest score), based on the descriptions of the patient and his or her family. The subscale scores were also weighted to calculate the total MOAS score: verbal aggression score multiplied by 1; aggressive property score multiplied by 2; self-aggression score multiplied by 3; and aggression toward others score multiplied by 4. The sum of these weighted scores was the total MOAS score.²⁰ Based on the MOAS total score, patients were divided into two groups: a total score ≥ 4 for the aggression group and a total score <4 for the non-aggression group.

Phq-9

Patients' depressed mood was assessed using the 9-item Patient Health Questionnaire (PHQ-9), which includes nine questions diminished interest, depressed mood, feelings of fatigue, eating disorders, difficulty concentrating, feelings of low self-esteem, excessive or lackluster behavior, sleep disturbances, and suicidal ideation. Responses range from 0 (not at all) to 3 (almost every day) and from 0 to 27, with higher scores indicating higher depressed mood. Studies have shown that the internal consistency and test retest reliability of the PHQ-9 is excellent²¹.

Statistical Analysis

The Kolmogorov–Smirnov test was utilized to determine whether the data distribution was normal. Normal continuous data are described by mean $\pm$ standard deviation (SD) and were tested using the *t*-test. The Mann–Whitney *U*-test was used to evaluate non-normal continuous data, and the median (interquartile spacing) was used to describe the data. Categorical variables were described by numbers and percentages and analyzed using the χ^2 test. Analysis of risk factors influencing aggressive behavior in schizophrenia patients using binary logistic regression was conducted. The correlation between the sample's characteristics and its aggression ratings was evaluated using Spearman correlation analysis or the *U*-test. After adjustment for confounders, Variables that might be connected to aggressive behavior were found using multiple linear regression analysis. Statistical tests were two-sided, with $P < 0.05$ considered significant. All data were analyzed using SPSS version 24.0 software (SPSS Inc., Chicago, IL).

Results

For this study, the sum of 821 people with schizophrenia were included, with an 18.8% prevalence of aggressive behavior and a mean age of 49.08 years (SD=11.971). The participants' demographic data and other details are shown in Table 1. The mean BMI of the patients was 25.026 (SD=4.309), with a slightly higher proportion of female patients (52.0%) than male (48.0%) and 701 patients (85.4%) had no religious affiliation. In addition, we saw that 84.5% of patients only had a junior high school education, 81.7% had no family history of mental illness, 90.6% lived with their families, 54.0% were married, 62.7% had no other comorbid physical illnesses, 79.4% had no smoking behavior, 91.4% had no alcohol abuse. 65.2% had no Physical exercise behavior, 81.4% of patients were unemployed, and 52.7% of patients had an average monthly family income between 500 and 2000 RMB.

Table 1 Demographic Characteristics and PHQ-9 Scores of Patients with Schizophrenia with and without Aggressive Behavior

Variables	Total Patients (N=821)	Patients without Aggression (667)	Patients with Aggression (154)	$t/\chi^2/Z$	p-value
Age (Mean $\pm$ SD)	49.08 $\pm$ 11.971	49.29 $\pm$ 11.875	48.09 $\pm$ 12.350	1.123	0.262
Genders				0.770	0.380
Female	427 (52.0%)	342 (51.3%)	85 (55.2%)		
Male	394 (48.0%)	325 (48.7%)	69 (44.8%)		
Religion				0.397	0.528
No	701 (85.4%)	572 (85.8%)	129 (83.8%)		
Yes	120 (14.6%)	95 (14.2%)	25 (16.2%)		
BMI (Mean $\pm$ SD)	25.029 $\pm$ 4.309	25.041 $\pm$ 4.313	24.812 $\pm$ 4.243	0.593	0.553
Educational level				5.897	0.015
Junior high school and below	694 (84.5%)	554 (83.1%)	140 (90.9%)		
Senior high school and above	127 (15.5%)	113 (16.9%)	14 (9.1%)		
Family history				0.069	0.793
No	671 (81.7%)	544 (81.6%)	127 (82.5%)		
Yes	150 (18.3%)	123 (18.4%)	27 (17.5%)		
Live alone				3.904	0.048
No	744 (90.6%)	598 (89.7%)	146 (94.8%)		
Yes	77 (9.4%)	69 (10.3%)	8 (5.2%)		

(Continued)

Table 1 (Continued).

Variables	Total Patients (N=821)	Patients without Aggression (667)	Patients with Aggression (154)	$t/\chi^2/Z$	p-value
Marital status				5.850	0.119
Never married	268 (32.6%)	217 (32.5%)	51 (33.1%)		
Married	443 (54.0%)	352 (52.8%)	91 (59.1%)		
Divorce	76 (9.3%)	69 (10.3%)	7 (4.5%)		
Widowed	34 (4.1%)	29 (4.3%)	5 (3.2%)		
Co-morbid disease				3.842	0.050
No	515 (62.7%)	429 (64.3%)	86 (55.8%)		
Yes	306 (37.3%)	238 (35.7%)	65 (44.2%)		
Smoke behavior				4.601	0.032
No	652 (79.4%)	520 (78.0%)	132 (85.7%)		
Yes	169 (20.6%)	147 (22.0%)	22 (14.3%)		
Drink habit				1.114	0.291
No	750 (91.4%)	606 (90.9%)	144 (93.5%)		
Yes	71 (8.6%)	61 (9.1%)	10 (6.5%)		
Physical exercise (times/week)				8.347	0.039
0	535 (65.2%)	422 (63.3%)	113 (73.4%)		
1–2	116 (14.1%)	96 (14.4%)	20 (13.0%)		
3–5	49 (6.0%)	40 (6.0%)	9 (5.8%)		
>5	121 (14.7%)	109 (16.3%)	12 (7.8%)		
Occupation				12.992	<0.001
No	668 (81.4%)	517 (79.0%)	141 (91.6%)		
Yes	153 (18.6%)	140 (21.0%)	13 (8.4%)		
Monthly income (yuan/month)				1.886	0.390
<500	306 (37.3%)	249 (37.3%)	57 (37.0%)		
500–2000	433 (52.7%)	347 (52.0%)	86 (55.8%)		
>2000	82 (10.0%)	71 (10.6%)	11 (7.1%)		
Age of onset(IQR)	24.50 (13.00)	25.00 (12.50)	24.00 (15.00)	−1.600	0.110
Course of illness(IQR)	21.00 (17.00)	21.00 (17.00)	21.00 (18.00)	−0.026	0.979
PHQ-9 (IQR)	6.00 (10.00)	5.00 (9.00)	11.00 (9.00)	−8.597	<0.001

Note: Bolded values: <0.05.

Abbreviations: PHQ-9, Patient Health Questionnaire with 9 items; BMI, Body Mass Index; IQR Interquartile Range.

As shown in Table 1, patients in the assault group had a lower level of education compared to the non-assault group ($F=5.897$, $p=0.015$). There were statistically significant differences in the form of residence ($F=3.904$, $p=0.048$), smoking behavior ($F=4.601$, $p=0.032$), and physical activity ($F=8.347$, $p=0.039$) between the two groups. Additionally, the percentage of unemployed individuals in the attack group was considerably higher than that in the non-assault group (91.6% vs 79.0%, $p<0.001$). In comparison to the non-assault group, the assault group's PHQ-9 ratings were considerably higher ($F=-8.597$, $p<0.001$).

As shown in Table 2, a multifactorial logistic regression equation was constructed by including education level, whether living alone, smoking behavior, physical activity status, work, and PHQ-9 score. The results found that the effects of education level on aggression in schizophrenia patients were statistically significant (OR=0.470, 95% CI 0.254–0.870), whether or not living alone on aggression in schizophrenia patients were statistically significant (OR=0.383, 95% CI 0.174–0.845), depressive mood on aggression in schizophrenia patients was statistically significant (OR=1.147, 95% CI 1.112–1.184).

In a univariate analysis, Table 3 demonstrates that poorer literacy ($p=0.028$), less physical activity ($p=0.005$), unemployment ($p=0.001$), younger age at disease debut ($p=0.010$), and higher melancholy mood ($p<0.001$) were linked with higher levels of aggression. Higher levels of violence remained correlated with lower literacy ($p=0.017$) and higher depressive symptoms ($p<0.001$) in multivariate analysis.

Table 2 Logistic Regression of Factors Associated with Aggression in Patients with Schizophrenia

Variables	b	SE	Wald	p	OR	95% CI
Constant	−2.492	0.186	179.624	<0.001	0.083	
Education level ^a	−0.754	0.314	5.769	0.016	0.470	0.254–0.870
Residence style ^b	−0.958	0.403	5.654	0.017	0.383	0.174–0.845
PHQ-9 rating	0.137	0.016	74.807	<0.001	1.147	1.112–1.184

Notes: ^aJunior high school and below is the control group; ^bLive together is the control group; Bolded values: <0.05.

Abbreviations: PHQ-9, Patient Health Questionnaire with 9 items; SE, standard error; OR, odds ratio; CI, confidence interval.

Table 3 Clinical and Sociodemographic Traits That Correlate with the Intensity of the Violence

Variables	Univariate Analysis		Multivariate Analysis	
	Aggression MOAS score M (IQR) Or R	p-value	β	p-value
Age	−0.041	0.236		
Genders		0.257	0.038	0.327
Female	0.00 (1.00)			
Male	0.00 (1.00)			
Religion		0.417		
No	0.00 (1.00)			
Yes	0.00 (2.00)			
BMI	−0.052	0.140		
Educational level		0.028	−0.082	0.017
Junior high school and below	0.00 (1.00)			
Senior high school and above	0.00 (0.00)			
Family history		0.901		
No	0.00 (1.00)			
Yes	0.00 (1.00)			
Live along		0.060	−0.057	0.097
No	0.00 (1.00)			
Yes	0.00 (0.00)			
Marital status		0.170		
Never married	0.00 (2.00)			
Married	0.00 (1.00)			
Divorce	0.00 (0.00)			
Widowed	0.00 (1.00)			
Co-morbid disease		0.096		
No	0.00 (1.00)			
Yes	0.00 (2.00)			
Smoke behavior		0.069	−0.024	0.524
No	0.00 (1.00)			
Yes	0.00 (0.00)			
Drink habit		0.435		
No	0.00 (1.00)			
Yes	0.00 (0.00)			
Physical exercise		0.005	−0.015	0.669
0	0.00 (2.00)			
1–2	0.00 (1.00)			
3–5	0.00 (1.00)			
>5	0.00 (0.00)			

(Continued)

Table 3 (Continued).

Variables	Univariate Analysis		Multivariate Analysis	
	Aggression MOAS score M (IQR) Or R	p-value	β	p-value
Occupation		0.001	−0.047	0.197
No	0.00 (2.00)			
Yes	0.00 (0.00)			
Monthly income(yuan/month)		0.509	0.042	0.244
<500	0.00 (1.00)			
500–2000	0.00 (1.00)			
>2000	0.00 (1.00)			
Age of onset	−0.091	0.010	−0.035	0.312
Course of illness	0.013	0.706		
PHQ-9	0.294	0.000	0.300	0.000

Note: Bolded values: <0.05.

Abbreviations: M (IQR), Median (Inter Quartile Range); MOAS, Modified Overt Aggression Scale; PHQ-9, Patient Health Questionnaire with 9 items; BMI, Body Mass Index.

Discussion

This is the first study to look at the link between depressed mood and aggressive behaviors in schizophrenia patients. Patients in the aggressive group had lower rates of smoking and living alone, higher percentages of unemployment, lower levels of education, and lower exercise practices as compared to the non-aggressive group. Depression, education level, and resident style were found to be significantly linked with aggressive behavior in schizophrenia patients using logistic regression analysis. Multiple linear regression showed that higher levels of aggression were associated with lower levels of education and higher depressive mood.

Aggressive behaviors are more common among the many symptoms of schizophrenia in patients. The prevalence of aggression in schizophrenia patients varies significantly around the world, ranging from 4.6% to 69.6%.⁵ Another large-scale study conducted in Norway found that 15.2% of schizophrenia outpatients were at risk for aggression.²² According to our findings, the prevalence of aggression in ambulatory patients was 18.8%. This result is consistent with previous studies. Several theories have attempted to explain why patients with schizophrenia are at higher risk of aggression, and for now, there are fewer studies on the neurobiology of this risk, but a number of candidate genes have been studied, the most studied being the catechol- o -methyltransferase (COMT) gene on chromosome 22.²³ According to a new meta-analysis of Val158Met COMT, men with schizophrenia who carry the COMT gene's low activity Met variant have a little higher risk of behaving violently.²⁴ Other research, focused on female patients with schizophrenia, raises the possibility that various bodily metabolic markers may be connected to the development of violence. Herceg et al pointed out that in female schizophrenia patients, lowered HDL cholesterol levels have been associated with aggression.²⁵ Another study showed that higher prolactin was significantly associated with aggression in female schizophrenia patients.²⁶

Persons with schizophrenia frequently experience depressive mood, and a meta-analysis including 9879 persons with schizophrenia indicated that the frequency of co-morbid depression in schizophrenia was about 28.6%.²⁷ Depression combined with aggression is also more common in adults. A recent longitudinal study of the entire Swedish population found that those with depression had a risk of aggression that was around three times higher than that of the general population and twice as high as that of their non-depressed siblings.²⁸ The most common form of aggression is self-aggression, which has been shown to mediate the relationship between depression and externalizing aggression.²⁹ Numerous research have proven that there is a strong link between depression and the emergence of violent conduct,^{30,31} however, it is unclear how the two are related causally. According to our research, having a high level of depression increases the likelihood that aggressive conduct would occur. Kofler et al found that a model in which early depressive symptoms predicted changes in maladaptive behaviors was more consistent with the data than a model in which maladaptive behaviors predicted depressive symptoms,³² which is consistent with our findings. But research has

also shown that frequent violence contributes to depressed symptoms.³³ These findings can be attributed to variations in the survey population and methodology.

In addition, we found that low education levels and living alone were also associated with aggressive behavior. Among them, low education level was a risk factor, while living alone was a protective factor. A previous study reported that schizophrenia patients who live alone lead to poor treatment adherence and high risk of relapse.³⁴ And since several previous studies have shown that the increase in aggression in psychiatric patients is directly proportional to the severity of their psychiatric symptoms,^{11,35} it would seem that psychiatric patients living alone are seemingly more likely to engage in aggressive behavior, which seems to contradict our findings. However, Swanson et al found that patients who lived with their family were more likely to act aggressively.³⁶ Living alone is a protective factor against agitation, according to results of another observational study from China.³⁷ There are several possible reasons for this. Firstly, because schizophrenia itself can lead to poorer social interactions, and because people with schizophrenia themselves carry a higher degree of stigma than other illnesses,³⁸ which can lead to social withdrawal. Therefore, the aggressive behavior of psychiatric patients living at home mostly occurs with their caregiving relatives, and studies have shown that more than half of the caregiving relatives report that they have had to deal with conflicts,^{39,40} both verbal and physical, and even more than one-fifth of the relatives said that they feared for their lives as a result.⁷ In contrast, psychiatric patients living alone do not have caregivers. Second, psychiatric patients who are able to live alone at home are themselves less symptomatic and less likely to engage in aggressive behavior. This is because in China, serious assaults and injuries can result in forced hospitalization by local authorities or other relatives, whereas this survey was conducted on homebound patients only. Third, some patients' family members may interfere with the patient's treatment, and there is evidence that some patients' family members may object to drug treatment.⁴¹ On the other hand, it has also been shown that patients with low levels of education are more likely to be aggressive than those with high levels of education,^{42,43} and the lower the level of education, the greater the likelihood of physical aggressiveness.^{44,45} Higher education, according to Harris and Kelly, can help people become less aggressive because it teaches them to think critically and restrains their emotional outbursts.⁴⁵ A study from Europe involving more than 27,000 adolescents suggests that aggression is strongly and negatively correlated with academic performance, and that part of these associations is explained by common genetic effects.⁴⁶ Additionally, it has been suggested that low levels of educational correspond to worse cognitive functioning, and that cognitive impairment is connected to aggressive and violent conduct in schizophrenia patients.⁴³ Because cognitive rehabilitation therapy may be beneficial for cognitive impairment.⁴⁷

In previous research, male gender and young age at first were determined to be risk factors for aggression in schizophrenia patients,⁴⁸ but in our study, our researchers did not discover a relationship between gender and aggression in patients with schizophrenia. The results of numerous studies on gender as a potential risk factor for aggressive behavior in people with schizophrenia vary. In a retrospective study, Vevera et al found that male and female aggressiveness prevalence rates were, respectively, 41.8% and 32.7% overall.⁴⁹ In contrast, in a large state psychiatric hospital in the United States, the rates of violent behavior during acute admission were 57.6% and 24.5% for women and men, respectively.⁵⁰ According to many studies, there is a variable relationship between gender and aggression in schizophrenia patients, which may be influenced by the local demographics of the survey area.¹⁰

It is crucial to note, however, that the current study had several limitations. First, because the study was cross-sectional, the interpretation of the causal association between aggression and risk variables in stable schizophrenics is limited. Therefore, to confirm the causal association, future research may concentrate on longitudinal investigations. Second, because our sample consisted of patients treated at home, the results may not be applicable to inpatients with schizophrenia. Third, this study was done only in the townships around Chaohu, which may not be representative for patients in other regions of China. Fourth, because only rural schizophrenia patients were examined in this article, the findings may not be generalizable to patients in the cities settings.

Conclusions

In conclusion, the current study revealed that 18.8% of stable schizophrenia patients exhibited violent conduct, which indicates that aggressive behavior is relatively common among schizophrenia patients. Furthermore, according to our findings, stable schizophrenics with poor educational levels and depressed mood are more likely to engage in aggressive

conduct. Although living alone is a protective factor, this may be related to the selection of the survey population and the fact that people with schizophrenia who live alone are still likely to engage in aggressive behavior. Aggression levels were correlated with education levels and depressive mood. These findings help physicians and families to prevent the onset of schizophrenic aggression early.

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Ethics Approval and Consent to Participate

The survey strictly followed the principles of the Helsinki Declaration and was approved by the Ethics Committee of Chaohu Hospital of Anhui Medical University. Ethics ID:KYXM-202212-013. We informed all respondents and their guardians of the purpose of this study and assured them that their privacy would not be compromised by signing, and all participants and their guardians signed an informed consent form.

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Disclosure

The authors report no conflicts of interest in this work.

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