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Independent Contributions of Social Functioning Deficits and Internalized Stigma to Quality of Life in Clinically Stable Patients with Schizophrenia: A Hierarchical Regression Analysis

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Background: Quality of life (QoL) is a core outcome in schizophrenia. Guided by the biopsychosocial model, this study examined whether social functional impairment and internalized stigma independently predict QoL and mediate the impact of depressive symptoms on QoL among clinically stable patients in rural China.

Methods: In a multicenter cross-sectional survey (Chaohu City, September–October 2022), 796 clinically stable adults with schizophrenia were recruited via stratified random sampling. Participants completed standardized assessments: Patient Health Questionnaire-9 (PHQ-9), Insomnia Severity Index (ISI), Social Disability Screening Schedule (SDSS), Social Impact Scale (SIS), and WHOQOL-BREF. Analyses included hierarchical regression (entering demographics/health, health behaviors, clinical symptoms [PHQ-9, ISI], and psychosocial factors [SDSS, SIS]) and parallel mediation analysis (PROCESS Model 4).

Results: PHQ-9, ISI, SDSS, and SIS scores differed significantly across QoL groups (all *p* <0.001). Hierarchical regression showed that explained variance increased from 2.9% (Model 1) to 21.8% (Model 4). After adjusting for all covariates, depressive severity (β = −0.230), social disability (β = −0.161), and stigma (β = −0.153) were robust negative predictors of QoL (all *p* <0.001). Mediation analyses revealed a significant total effect of depression on QoL (−0.037, 95% CI [−0.046, −0.027]). This effect was partially mediated by social disability (indirect effect: −0.005, 95% CI [−0.008, −0.002]; proportion: 13.5%) and stigma (−0.006, 95% CI [−0.009, −0.003]; 16.2%), with a significant total indirect effect accounting for 29.7% of the total effect.

Conclusion: Social functional impairment and internalized stigma were independent predictors of QoL and statistically mediated the relationship between depressive symptoms and poorer QoL in clinically stable schizophrenia. Moving beyond symptom control to integrated interventions targeting these psychosocial pathways is crucial for enhancing QoL, especially in resource-limited rural settings.

Keywords: schizophrenia, quality of life, depressive disorder, social stigma, social adjustment, rural population

Introduction

Schizophrenia is a common and severe psychiatric disorder. By 2021, an estimated 21.38 million people worldwide were living with schizophrenia.[1] The illness typically emerges in early adulthood, follows a chronic, relapsing course, and generally requires long-term antipsychotic treatment.[2] Despite pharmacotherapy, substantial disability persists, including cognitive impairment and social functional deficits, which frequently erode patients' quality of life (QoL).[3] As a key indicator of prognosis, QoL has become a global public health concern. Although no universal definition exists, there is

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broad consensus that QoL in schizophrenia is a multidimensional, dynamic construct that integrates subjective and objective domains. It reflects patients' overall satisfaction with their psychological state (eg., well-being, self-esteem), social functioning (eg., interpersonal relationships, role participation), physical health (eg., symptom control, medication side effects), and living environment (eg., housing, economic conditions) under the influence of the illness and its treatment, while also incorporating objective indices such as functional capacity and social integration.[4]

Multiple predictors shape QoL in schizophrenia, including depressive symptoms, reluctance to seek care, inadequate follow-up and psychosocial support, stigma and social isolation, tobacco and alcohol use, social functional decline, unemployment, and lack of family support.[4] Depressive symptoms are prevalent across all stages of the disorder and are consistently associated with higher residual psychopathology, poorer functioning, and worse QoL.[5] Importantly, even after adjusting for age, sex, negative symptoms, and clinical insight, depression remains an independent predictor of diminished subjective health appraisal and overall QoL.[6]

Two interrelated challenges—social functional impairment and stigma—critically hinder community reintegration. Social dysfunction is a defining feature of schizophrenia, compromising vocational engagement, social relationships, and activities of daily living. These impairments undermine autonomy, worsen disability, and diminish QoL.[7] Concurrently, public misunderstanding and discrimination foster internalized stigma, which can lower self-worth, deter help-seeking, and exacerbate social isolation. Empirical work indicates that the "alienation" component of internalized stigma indirectly worsens QoL by reducing self-esteem, while stereotype endorsement and alienation exert direct adverse effects on psychosocial and physical QoL.[8] Cross-sectional data further suggest that higher levels of hopelessness, depression, and suicide risk among people with schizophrenia (PWS) are linked to stigma.[9] In the acute phase of schizophrenia, positive symptoms such as hallucinations and delusions predominantly drive clinical outcomes and QoL impairment.[10] Once patients achieve clinical stability—defined by symptom stabilization and a consistent medication regimen—the direct impact of positive symptoms diminishes.[10] During this phase, psychosocial factors such as social functioning deficits and internalized stigma are hypothesized to become the primary predictors of QoL.[11] On this basis, we posit that negative symptoms may contribute to poorer QoL indirectly by intensifying social functional deficits and internalized stigma. However, this mediational pathway has yet to be tested rigorously in clinically stable populations.

Guided by the biopsychosocial model of schizophrenia, the present study advances a core hypothesis: among clinically stable patients, social functional impairment and internalized stigma not only act as independent predictors of QoL but also constitute key mediators linking depressive symptoms to subjective QoL.[12] To test this hypothesis, we will employ hierarchical regression to sequentially enter demographic variables, clinical characteristics, and psychosocial factors, thereby delineating the independent contribution of each layer and quantifying the incremental variance explained by psychosocial variables beyond foundational covariates. Building on this framework, we will conduct mediation analyses with a specific focus on the mediating roles of social functioning and internalized stigma. We anticipate that the findings will clarify the central impact of psychosocial processes on outcomes in schizophrenia—broadening the field's traditionally symptom-centric perspective—and provide a robust empirical basis for precision rehabilitation strategies that prioritize QoL as the ultimate therapeutic target in clinically stable schizophrenia.

Material and Methods

Participants

This multicenter cross-sectional survey was conducted from September to October 2022 in Chaohu City, Hefei, Anhui Province, China. The study area covered six urban subdistricts and twelve rural townships. Eligible participants were individuals with schizophrenia registered in the local Severe Mental Disorder Management System. All participants were drawn from the Chaohu Severe Mental Disorder Management Database, which includes over 3000 registered patients. Using stratified random sampling with a 3:1 allocation, we distributed 1205 paper questionnaires and obtained 796 valid, complete responses, yielding a valid response rate of 66.06%.

Inclusion criteria were: (1) registration in China's Severe Mental Disorder Management System; (2) a psychiatrist-confirmed diagnosis of schizophrenia according to ICD-10 criteria, based on medical records; (3) clinical stability as assessed by a psychiatrist, defined as no significant change in clinical status (ie., no acute exacerbation requiring hospitalization or

emergency intervention) and a change in the primary psychotropic dose of less than 50% over the preceding 3 months. While symptom-based criteria (eg., PANSS) were not available in this large-scale rural survey, this combined definition—incorporating both clinical judgment and medication stability—has been commonly used in similar resource-limited settings. (4) age 18–75 years; (5) absence of other comorbid psychiatric disorders; (6) residence in Chaohu's subdistricts or rural townships, with the ability to complete the assessment and provide valid information; and (7) provision of written informed consent by the patient or a legal guardian after full explanation of study aims and procedures.

Exclusion criteria were: (1) a documented history of neurological disease or drug/substance abuse, alcohol dependence, or acute risk of violent behavior; (2) severe physical illness associated with high mortality risk; (3) comorbid schizoaffective disorder, paranoid psychosis, bipolar disorder, epilepsy-related psychiatric disorder, or intellectual disability with comorbid psychiatric symptoms; (4) pregnancy or lactation; and (5) unwillingness to participate or inability to complete the assessment due to cognitive or communication difficulties.

Data were collected by uniformly trained investigators using standardized instructions. If participants exhibited distress or impulsive behavior during completion, staff implemented de-escalation/emotion-stabilization techniques; participants who could not continue were allowed to withdraw at any time. A study-specific questionnaire captured sociodemographic data (eg., age, sex, body mass index, educational level, marital status), and clinical interviews were used to obtain illness duration, age at onset, physical comorbidities, and depression scores.

The study was approved by the Ethics Committee of Chaohu Hospital, Anhui Medical University (approval NO. KYXM-202212-013). All procedures adhered to the principles of the Declaration of Helsinki. Before participation, patients and family members were fully informed of the study's purpose, methods, potential risks, and privacy protections. Written informed consent was obtained, and participants' rights to information, privacy, and voluntary withdrawal were ensured throughout.

Measures

Sociodemographic Characteristics

A bespoke questionnaire was used to systematically collect sociodemographic and clinical background information, including age (years), sex (male/female), marital status (unmarried/married), income (yes/no), presence of other chronic diseases (yes/no), and co-residence with family (yes/no). Nearly all patients were accompanied by family members, who helped verify and supplement information to enhance data reliability.

Clinical and Health Behavior Characteristics

Clinical and health behavior data were obtained via a study-specific questionnaire and clinical interview. All variables were coded dichotomously (yes/no) and included: medication adherence (assessed by "regular use of psychotropic medication," defined as taking medication strictly according to the psychiatrist's prescription in dose and timing; otherwise classified as nonadherent), current smoking, current alcohol use, and regular physical activity (defined as exercising at least three times per week for at least 30 minutes per session). Patients and accompanying family members jointly confirmed all behavioral information to ensure accuracy.

Depressive Symptoms

Depressive symptoms in people PWS were assessed with the 9-item Patient Health Questionnaire (PHQ-9), developed by Spitzer et al based on the DSM-IV criteria for major depression. Owing to its brevity and ease of use, the PHQ-9 is widely applied in research and clinical practice. The validated Chinese version by Bian et al has demonstrated suitability in Chinese populations. The PHQ-9 covers nine symptom domains: anhedonia, depressed mood, fatigue, appetite change, concentration difficulties, feelings of worthlessness or low self-esteem, psychomotor agitation/retardation, sleep disturbance, and suicidal ideation. Items are rated 0 (not at all) to 3 (nearly every day) for the past two weeks; total scores range from 0 to 27, with higher scores indicating more severe depression. In this study, score bands were defined as follows: 0–4 none/minimal, 5–9 mild, 10–14 moderate, and both 15–19 and ≥20 classified as severe. The Chinese PHQ-9 has shown good psychometric properties, including internal consistency (Cronbach's $\alpha = 0.86$ in general outpatient samples) and acceptable test–retest reliability.[13]

It is important to note that the PHQ-9, while widely used and validated in general populations, does not distinguish between depressive symptoms and negative symptoms (eg., anhedonia, fatigue, concentration difficulties) in schizophrenia. This limitation should be considered when interpreting the findings, as overlapping symptomatology may introduce potential confounding.

Insomnia

Insomnia severity was measured using the Insomnia Severity Index (ISI), a widely used instrument developed by Morin et al.[14] The ISI consists of seven self-report items covering core insomnia domains: difficulty initiating sleep, difficulty maintaining sleep, early morning awakening, sleep quality, daytime impairment due to sleep problems, worry about sleep, and interference with QoL Each item is rated from 0 (no problem) to 4 (very severe problem), yielding a total score of 0–28. A total score ≥8 was taken to indicate clinically meaningful insomnia, with higher scores reflecting greater severity. The Chinese ISI has undergone rigorous psychometric validation, demonstrating strong construct and criterion validity and excellent internal consistency (Cronbach's $\alpha = 0.94$).[15]

Stigma

Perceived stigma was assessed with the Social Impact Scale (SIS). Originally developed by Fife et al and culturally adapted into Chinese by Pan et al (2007), the SIS comprises 24 items across four domains: social exclusion (9 items), financial insecurity (3 items), internalized shame (5 items), and social isolation (7 items).[16] Items are rated on a 4-point Likert scale from 1 (strongly disagree) to 4 (strongly agree); total scores range from 24 to 96, with higher scores indicating greater perceived stigma. The scale exhibits sound psychometric properties in Chinese samples, including robust internal consistency across subscales (Cronbach's $\alpha = 0.85–0.90$) and moderate inter-dimension correlations ($r = 0.28–0.66$), supporting a coherent yet distinct factor structure.[13]

Social Functional Impairment

Social functioning was evaluated using the Social Disability Screening Schedule (SDSS), a World Health Organization–recommended instrument widely used to assess functional status in psychiatric populations. The SDSS comprises 10 core items covering key domains of daily living and social participation, reflecting role performance, life skills, and interpersonal functioning. Each item is scored 0–2 (0 = no abnormality or only trivial, nonproblematic difficulty; 1 = definite impairment with some impact on daily life; 2 = severe impairment preventing normal role functioning). Non-applicable items (eg., marital role for unmarried participants) are coded "9" and excluded from scoring. The total score (sum of valid items) ranges from 0 to 20; consistent with Chinese epidemiological and disability survey standards, a total score ≥2 indicates social disability, with higher scores denoting more severe impairment. The reliability of the Chinese version of the SDSS employed has been established in its standardized manual.[17]

Quality of Life

Subjective QoL was measured using the World Health Organization Quality of Life–BREF (WHOQOL-BREF), developed by the WHOQOL Group and widely used internationally.[18,19] Items are rated on 5-point Likert scales; weighted raw scores are aggregated to yield domain and total scores, with higher scores reflecting better QoL. To delineate subjective satisfaction with QoL, we used the instrument's global QoL item to classify participants as dissatisfied (≤2), neutral (3), or satisfied (≥4). Prior studies report acceptable internal consistency for the WHOQOL-BREF (Cronbach's $\alpha \approx 0.78$) in comparable populations. For statistical analyses, QoL scores were treated as continuous variables.

Statistical Analysis

All analyses were conducted using IBM SPSS Statistics, version 25.0. The significance level (α) was set at 0.05, and tests were two-sided. Normality of continuous variables was examined with the Shapiro–Wilk test. Continuous variables are reported as mean ± standard deviation (Mean ± SD). Categorical variables are summarized as counts and percentages (n [%]). Spearman's rank correlation was used to assess associations between candidate factors and QoL.

To evaluate the independent effects of social functional impairment and stigma on QoL while adjusting for potential confounders, we performed hierarchical multiple linear regression with forced-entry blocks. The dependent variable was

the continuous WHOQOL-BREF total score. Guided by the biopsychosocial framework, predictors were entered sequentially in blocks. Based on the regression results and our a priori model, mediation analyses were conducted using Hayes's PROCESS macro for SPSS (version 4.1; Model 4) to test whether social functional impairment and stigma mediate the relationship between depressive symptoms and QoL. Indirect effects were estimated with bias-corrected percentile bootstrapping (5,000 resamples) to derive 95% confidence intervals (CIs). Mediation was deemed significant if the CI did not include zero. All analyses followed a complete-case approach, with cases containing missing data automatically excluded. In interpreting the mediation results, it is important to note that the cross-sectional design precludes causal inference regarding temporal ordering. The mediation model should be viewed as a statistical estimation of indirect effects based on associations, rather than a test of causal mechanisms.

Results

General Characteristics and Clinical Health Behaviors

A total of 796 people with schizophrenia were included; 20.5% were classified as dissatisfied with their QoL. Sociodemographic characteristics and additional details are presented in Table 1. The mean age was 49.03 (SD = 11.91) years, and the mean BMI was 25.10 (SD = 4.20). Women comprised 52.1% of the sample. Overall, 53.8% were

Table 1 Demographic Characteristics of the Sample by Quality of Life Group

Variables	Total Samples (n=796)	Dissatisfied Group (n=163)	Neutral Group (n=461)	Satisfied Group (n=172)	Statistic	P-Value
Age	49.03±11.91	49.3(41.0,57.0)	48.9(40.0,57.0)	49.2(40.0,57.0)	H=0.204	0.903
Gender						
Female	415(52.1%)	89(54.6%)	246(53.4%)	80(46.5%)	$\chi2$=2.855	0.240
Male	381(47.9%)	74(45.4%)	215(46.6%)	92(53.5%)		
BMI	25.10±4.20	24.36±3.85	25.41±4.32	24.97±4.08	H=8.994	**0.011***
Marital status						
No	368(46.2%)	80(49.1%)	204(44.3%)	84(48.8%)	$\chi2$=1.729	0.421
Yes	428(53.8%)	83(50.3%)	257(55.7%)	88(51.2%)		
Household income						
No	300(37.7%)	60(36.8%)	200(43.4%)	40(23.3%)	$\chi2$=22.677	**0.000*****
Yes	496(62.3%)	103(63.2%)	261(52.6%)	132(76.7%)		
Family history of mental illness						
No	653(82.0%)	138(84.7%)	379(82.2%)	136(79.1%)	$\chi2$=1.800	0.407
Yes	143(18.0%)	25(15.3%)	82(17.8%)	36(20.9%)		
Chronic physical comorbidities						
No	496(62.3%)	100(61.3%)	286(62.0)	110(64.0%)	$\chi2$=0.276	0.871
Yes	300(37.7%)	63(38.7%)	175(38.0%)	62(36.0)		
Living arrangement						
Living alone	75(9.4%)	23(14.1%)	41(8.9%)	11(9.4%)	$\chi2$=6.195	**0.045***
Living with family	721(90.6%)	163(85.9%)	410(91.1%)	172(90.6%)		

Notes: Continuous data are expressed as mean ± standard deviation, and categorical data are expressed as number (percentage). Bold values indicate statistical significance ($p < 0.05$). *p<0.05, ***p<0.001.

Abbreviation: BMI, Body mass index.

Table 2 Health Behaviors by Quality of Life Group

Variables	Total Samples (n=796)	Dissatisfied Group (n=163)	Neutral Group (n=461)	Satisfied Group (n=172)	Statistic	p-Value
Medication adherence						
No	79(9.9%)	25(15.3%)	39(8.5%)	15(8.7%)	χ2=6.727	**0.035***
Yes	717(90.1%)	138(84.7%)	422(91.5%)	157(91.3%)		
Smoking status						
No	650(81.7%)	133(81.6%)	384(83.3%)	133(77.3%)	χ2=2.983	0.225
Yes	146(18.3%)	30(18.4%)	77(16.7%)	39(22.7%)		
Alcohol use						
No	742(93.2%)	157(96.3%)	431(93.5%)	154(89.5%)	χ2=6.223	**0.045***
Yes	54(6.8%)	6(3.7%)	60 (6.5%)	18(10.5%)		
Regular physical activity						
No	521(65.5%)	117(71.8%)	302(65.5%)	102(59.3%)	χ2=5.763	0.056
Yes	275(34.5%)	46(28.2%)	159(34.5%)	70(40.7%)		

Notes: Medication adherence: regular use of psychotropic medication strictly according to the psychiatrist's prescription in dose and timing; otherwise classified as nonadherent; Smoking status: smoking at the time of assessment; Alcohol use: alcohol consumption at the time of assessment; Regular physical activity: exercising at least three times per week for at least 30 minutes per session. Categorical data are expressed as number (percentage). Bold values indicate statistical significance ($p < 0.05$). *p<0.05.

married, 62.3% reported household income, 82.0% reported no family history of mental illness, 62.3% had no other chronic diseases, and 90.6% lived with family members. Across the three QoL groups (dissatisfied, neutral, satisfied), there were significant differences in BMI ($H = 8.994$, $p = 0.011$), household income ($\chi^2 = 22.677$, $p < 0.001$), and living arrangement ($\chi^2 = 6.195$, $p = 0.045$).

Clinical health behaviors are summarized in Table 2. Overall, 90.1% were adherent to prescribed psychotropic medications, 81.7% were nonsmokers, 93.2% reported no hazardous alcohol use, and 65.5% did not engage in regular physical activity. Significant between-group differences were observed for medication adherence ($\chi^2 = 6.727$, $p = 0.035$) and alcohol use ($\chi^2 = 6.223$, $p = 0.045$).

Clinical Symptom Scores and Psychosocial Functioning

As shown in Table 3, PHQ-9 total scores differed significantly across QoL groups ($H = 111.475$, $p < 0.001$), with the highest scores in the dissatisfied group (11.21 ± 6.20), followed by the neutral group (6.99 ± 5.77), and the lowest in the

Table 3 Scores on Clinical and Psychosocial Measures

Variables	Total Samples (n=796)	Dissatisfied Group (n=163)	Neutral Group (n=461)	Satisfied Group (n=172)	Statistic	p-Value
PHQ-9	7.23±6.06	11.21±6.20	6.99±5.77	4.104.41	H=111.475	**0.000*****
ISI	5.27±7.52	8.88±9.11	4.92±7.12	2.77±5.40	H=38.444	**0.000*****
SDSS	10.57±5.17	12.99±4.46	10.51±5.10	8.42±5.02	H=63.412	**0.000*****
SIS	37.10±9.83	41.05±9.02	37.18±9.83	33.13±9.02	H=56.952	**0.000*****

Notes: Continuous data are expressed as mean ± standard deviation. Bold values indicate statistical significance ($p < 0.05$). ***p<0.001.
Abbreviations: PHQ-9, 9-item Patient Health Questionnaire; ISI, Insomnia Severity Index; SIS, Social Impact Scale; SDSS, Social Disability Screening Schedule.

satisfied group (4.10 ± 4.41). ISI total scores showed a similar gradient (H = 38.444, p < 0.001): dissatisfied 8.88 ± 9.11, neutral 4.92 ± 7.12, satisfied 2.77 ± 5.40. SDSS total scores also differed significantly (H = 63.412, p < 0.001), with means of 12.99 ± 4.46 (dissatisfied), 10.51 ± 5.10 (neutral), and 8.42 ± 5.02 (satisfied). SIS total scores varied likewise (H = 56.952, p < 0.001): 41.05 ± 9.02, 37.18 ± 9.83, and 33.13 ± 9.02 for the dissatisfied, neutral, and satisfied groups, respectively. Collectively, these findings indicate robust between-group differences across depression, insomnia, social functioning, and perceived stigma, aligned with QoL satisfaction status.

Correlations Between QoL and Other Variables

Spearman correlations (Table 4) showed that QoL was positively associated with living arrangement (r = 0.091, p = 0.011), household income (r = 0.100, p = 0.005), alcohol use status (r = 0.080, p = 0.024), and regular physical activity (r = 0.091, p = 0.010). QoL was negatively correlated with PHQ-9 (r = −0.386, p < 0.001), ISI (r = −0.264, p < 0.001), SDSS (r = −0.280, p < 0.001), and SIS (r = −0.267, p < 0.001) total scores. No significant correlations were observed for age, sex, marital status, family history of mental illness, BMI, other chronic diseases, smoking status, or medication adherence (all p > 0.05).

Table 4 Correlations Between QoL and Other Variables

Variable	r	p-Value
Age	0.021	0.548
Gender	0.038	0.290
Marital status	0.009	0.791
Family history of mental illness	0.045	0.208
BMI	0.061	0.085
Chronic physical comorbidities	−0.025	0.473
Living arrangement	0.091	**0.011***
Household income	0.100	**0.005****
Smoking status	0.030	0.391
Alcohol use	0.080	**0.024***
Regular physical activity	0.091	**0.010***
Medication adherence	0.064	0.070
PHQ-9	−0.386	**0.000*****
ISI	−0.264	**0.000*****
SDSS	−0.280	**0.000*****
SIS	−0.267	**0.000*****

Notes: Medication adherence: regular use of psychotropic medication strictly according to the psychiatrist's prescription in dose and timing; otherwise classified as non-adherent; Smoking status: smoking at the time of assessment; Alcohol use: alcohol consumption at the time of assessment; Regular physical activity: exercising at least three times per week for at least 30 minutes per session. Data are Spearman's rank correlation coefficients (r). Bold values indicate statistical significance (p < 0.05). *p<0.05, **p<0.01, ***p<0.001.

Abbreviations: PHQ-9, 9-item Patient Health Questionnaire; ISI, Insomnia Severity Index; SIS, Social Impact Scale; SDSS, Social Disability Screening Schedule.

Risk Factors for QoL in Schizophrenia

Hierarchical linear regression was used to examine independent predictors of QoL after sequential adjustment for covariates. As shown in Table 5, Model 1 (demographics and basic health variables) explained 2.9% of the variance ($F = 2.952$, $p < 0.05$). Adding clinical health behavior variables in Model 2 increased explained variance to 4.8% ($\Delta R^2 = 0.019$; $F = 3.282$, $p < 0.05$). Incorporating PHQ-9 and ISI scores in Model 3 further improved explained variance to 18.1% ($\Delta R^2 = 0.133$; $F = 12.347$, $p < 0.001$). Finally, adding SDSS and SIS scores in Model 4 raised explained variance to 21.8% ($\Delta R^2 = 0.036$; $F = 13.547$, $p < 0.001$).

At the variable level, age was a significant positive predictor across all models ($\beta = 0.086–0.093$, $p < 0.05$). Living arrangement remained significant in Models 2–4 ($\beta = 0.094–0.117$, $p < 0.01$), and family history of mental illness reached significance in Model 4 ($\beta = 0.071$, $p < 0.05$). Among health behaviors, alcohol use was significant in Models 2 and 3 ($\beta = 0.090$ and 0.077, respectively; $p < 0.05$), and regular physical activity was significant in Model 2 ($\beta = 0.085$, $p < 0.05$) but became nonsignificant after adding psychosocial variables. Regarding clinical symptoms, depressive severity (PHQ-9) showed a robust negative association with QoL in Models 3 and 4 ($\beta = -0.339$ and -0.230, respectively; both $p <$

Table 5 Hierarchical Regression Analysis of Factors Associated with Quality of Life

Variable	Model 1		Model 2		Model 3		Model 4	
	β	t	β	t	β	t	β	t
Age	0.086	2.148*	0.081	1.974*	0.093	2.422*	0.093	2.466*
Gender	0.057	1.419	0.034	0.759	0.027	0.661	0.006	0.150
Marital status	−0.023	−0.526	−0.029	−0.66	0.018	0.444	0.025	0.611
Family history of mental illness	0.042	1.204	0.044	1.248	0.058	1.761	0.071	2.209*
BMI	0.066	1.819	0.064	1.772	0.027	0.814	0.028	0.842
Chronic physical comorbidities	−0.039	−1.067	−0.030	−0.815	0.020	0.594	0.018	0.536
Living arrangement	0.098	2.579*	0.117	3.052**	0.103	2.913**	0.094	2.704**
Household income	0.096	2.670**	0.085	2.367*	0.023	0.681	0.007	0.209
Smoking status	–	–	0.007	0.184	−0.010	−0.264	−0.009	−0.244
Alcohol use	–	–	0.090	2.428*	0.077	2.243*	0.056	1.650
Regular physical activity	–	–	0.085	2.414*	0.036	1.081	0.014	0.429
Medication adherence	–	–	0.069	1.932	0.044	1.324	0.040	1.208
PHQ-9	–	–	–	–	−0.339	−8.326***	−0.230	−5.251***
ISI	–	–	–	–	−0.075	−1.850	−0.072	−1.812
SDSS	–	–	–	–	–	–	−0.161	−4.375***
SIS	–	–	–	–	–	–	−0.153	−4.376***
R2	0.029		0.048		0.181		0.218	
ΔR2	0.029		0.019		0.133		0.036	
F	2.952**		3.282**		12.347***		13.547***	

Notes: Model 1: demographics and basic health; Model 2: Model 1 + health behaviors; Model 3: Model 2 + clinical symptoms (PHQ-9, ISI); Model 4: Model 3 + psychosocial factors (SDSS, SIS). Data are standardized beta coefficients (β). *p < 0.05, **p < 0.01, ***p < 0.001.

Abbreviations: PHQ-9, 9-item Patient Health Questionnaire; ISI, Insomnia Severity Index; SIS, Social Impact Scale; SDSS, Social Disability Screening Schedule.

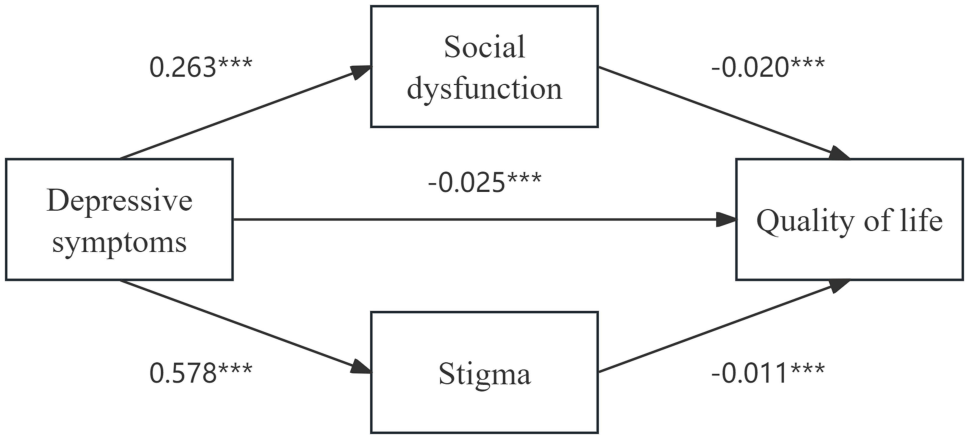

Figure 1 Parallel mediation analysis showed an association between depression symptoms, social dysfunction, stigma and quality of life. ***p<0.001.

0.001). In Model 4, both social functional impairment (SDSS; β = −0.161, p < 0.001) and stigma (SIS; β = −0.153, p < 0.001) were significant negative predictors of QoL. Sex, marital status, BMI, other chronic diseases, smoking, medication adherence, and ISI scores were not significant predictors in any model.

Mediation by Social Functional Impairment and Stigma

In the hierarchical regressions, the standardized coefficient for PHQ-9 predicting QoL decreased after SDSS and SIS were entered, indicating partial mediation by social functional impairment and stigma.

Parallel mediation analysis using the PROCESS macro confirmed these effects. As shown in Figure 1 and Table 6, total association between depressive symptoms and QoL was significant (total effect = −0.037, 95% bootstrapped CI [−0.046, −0.027], p < 0.001). After including SDSS and SIS as parallel mediators, the direct effect remained significant but attenuated (direct effect = −0.025, 95% CI [−0.035, −0.016], p < 0.001). The indirect association via social functional impairment (SDSS) was significant (indirect effect = −0.005, 95% CI [−0.008, −0.002]), accounting for 13.5% of the total effect. The indirect effect via stigma (SIS) was also significant (indirect effect = −0.006, 95% CI [−0.009, −0.003]), accounting for 16.2% of the total effect. The difference between the two indirect effects was not significant (difference = 0.001, 95% CI [−0.003, 0.005]), suggesting comparable mediating roles. The total indirect effect was significant (−0.011, 95% CI [−0.016, −0.007]), representing 29.7% of the total effect, indicating that nearly one-third of the impact of depressive symptoms on QoL is transmitted through psychosocial pathways.

Table 6 Social Dysfunction and Stigma as a Parallel Mediator Between Depressive Symptoms and Quality of Life

	Effect	SE/BootSE	LLCI/BootLLCI	ULCI/BootULCI	Proportion Mediated %
Total effect	−0.037***	0.005	0.000	−0.046	100%
Direct effect (depressive symptoms)	−0.025***	0.005	0.000	−0.035	71.3%
Total indirect effect	−0.011	0.002	−0.016	−0.007	29.7%
Social dysfunction	−0.005	0.002	−0.008	−0.002	13.5%
Stigma	−0.006	0.001	−0.009	−0.003	16.2%
Indirect Effect Comparison	0.001	0.002	−0.003	0.005	

Notes: Indirect effect comparison = Social dysfunction minus Stigma. ***p < 0.001.

Discussion

This study provides an integrated examination of the impact of social functioning and stigma on QoL among clinically stable people with PWS in rural China. We systematically evaluated their predictive roles and, through parallel mediation analysis, delineated the pathways through which depressive symptoms impair QoL via these psychosocial factors. We systematically evaluated the predictive roles of social functional impairment and perceived stigma in clinically stable patients and, using hierarchical regression and parallel mediation analyses, delineated the pathways through which these factors relate to QoL. Collectively, the findings support our core hypothesis derived from the biopsychosocial model and highlight the pivotal role of psychosocial mechanisms in linking depressive symptoms to QoL among clinically stable PWS.

Age emerged as a significant positive predictor of QoL across all regression models, which contrasts with some cross-sectional reports of a negative association between age and QoL in schizophrenia.[20] This discrepancy may reflect an "adaptation effect" among clinically stable, older patients: over a prolonged illness course, they may develop more effective illness self-management and social adaptation strategies, and/or benefit from more stable family and social support.[21] Consistent with this, co-residence with family was positively associated with QoL, aligning with the view that family support buffers the adverse effects of mental illness. Living with family can provide practical care, emotional comfort, and social connectedness, thereby reducing loneliness and enhancing subjective well-being.[22]

Additionally, univariate analyses indicated that certain sociodemographic (eg., household income, living arrangement) and behavioral factors (eg., alcohol use, regular exercise) were associated with QoL grouping in clinically stable PWS. However, after accounting for clinical symptoms and psychosocial variables, most of these associations were attenuated or lost significance. Specifically, regular physical activity showed a significant positive correlation with QoL in unadjusted analyses, but this association became nonsignificant after controlling for psychosocial factors, suggesting that exercise may improve QoL partly by enhancing social functioning or reducing stigma.[23] Alcohol use exhibited a positive association with QoL in Models 2 and 3; this unexpected finding warrants cautious interpretation and may reflect a "self-medication" phenomenon—temporary relief of anxiety or stigma-related distress through drinking.[24,25] Nevertheless, prior research indicates that sustained alcohol use exacerbates psychiatric symptoms and impairs social functioning, but its potential detrimental effects on QoL should not be overlooked.[26] Finally, economic hardship may not act directly on QoL; rather, it may exert indirect effects by amplifying perceived stigma or limiting opportunities for social participation.[27]

Depressive symptoms emerged as the strongest negative predictor of QoL in this study. This finding aligns with prior literature underscoring the pervasive, deleterious impact of depression on subjective well-being and functional recovery across the course of schizophrenia.[28,29] In PWS, depressive symptomatology extends beyond low mood to encompass negative symptom–like features such as anhedonia, reduced energy, and amotivation—dimensions that directly erode the capacity to pursue and experience meaning in life. Unlike relatively controllable positive symptoms in the stable phase (eg., hallucinations, delusions), residual depressive symptoms (eg., anhedonia, low self-esteem, hopelessness) more directly degrade subjective appraisals of mental health, dampen motivation for social participation, and impair activities of daily living.[30] These findings highlight the central adverse role of depression in prognosis and emphasize the importance of targeted interventions for depressive symptoms (eg., cognitive-behavioral therapy, adjunctive antidepressant strategies) to improve QoL among clinically stable PWS. Notably, the predictive strength of depression attenuated after social functioning and stigma were entered into the models, suggesting that part of its impact is transmitted via diminished social functioning and heightened internalized stigma.

One of the most consequential findings is that social functional impairment and perceived stigma independently and significantly predict poorer QoL, with contributions comparable to certain clinical symptoms. The final model confirmed that both higher SDSS and SIS scores were robust negative predictors of QoL, demonstrating their independent effects beyond demographic and clinical covariates. This indicates that QoL is not determined solely by symptom burden; it is tightly linked to the degree of functional disability and the experience of internalized stigma. Social functional impairment—a hallmark of schizophrenia—captures enduring difficulties in interpersonal relationships, vocational roles, and daily responsibilities.[31] The SDSS provides a comprehensive assessment of these multidimensional deficits,

which showed strong negative correlations with QoL in our data, consistent with WHO assertions that social functioning is a key predictor of recovery in mental disorders.[32] Mechanistically, such impairments restrict access to social support and opportunities for goal attainment and self-efficacy, undermining employment, intimate relationships, and self-care. These constraints can precipitate economic hardship and social isolation, narrowing life space and diminishing subjective well-being and satisfaction—constituting a core barrier on the objective dimension of QoL.[33] Stigma—particularly internalized stigma as captured by the SIS—also exerted a critical influence. Higher stigma scores were associated with lower QoL, consistent with evidence that internalized stigma fosters endorsement of negative stereotypes, low self-esteem, reduced help-seeking, and avoidance of social interaction.[34] Importantly, the independent predictive effect of stigma indicates that even in the absence of severe depression or overt functional deficits, internalized stigma alone can substantially undermine QoL.

Parallel mediation analyses provide a mechanistic account linking depressive symptoms, psychosocial processes, and QoL. Approximately 30% of the total effect of depression on QoL was mediated by social functional impairment and internalized stigma operating in parallel. This model dynamically connects internal symptom burden to external psychosocial outcomes and, ultimately, health-related quality of life. On one pathway, depressive symptoms reduce social participation and role performance; anhedonia, fatigue, and amotivation diminish willingness to engage in social interactions and daily activities, leading to "use-it-or-lose-it" functional decline. Patients may withdraw from employment or social gatherings, with consequent loss of vocational skills and relationships, which further exacerbates social disability.[35] On the other pathway, depressed mood deepens negative self-appraisal; co-occurring low self-esteem and maladaptive attributions increase the likelihood of internalizing societal stigma, including interpreting neutral social cues as discriminatory. This amplifies internalized stigma and directly worsens QoL. Together, these pathways clarify how depression degrades QoL via intertwined psychosocial mechanisms and underscore the necessity of integrated interventions that simultaneously target depressive symptoms, functional rehabilitation, and stigma reduction.[36,37]

In rural China, the predominance of manual, labor-intensive production stands in sharp conflict with the pervasive social functional impairment observed in people with schizophrenia, precipitating a "illness–functional loss–livelihood crisis" cascade. Rural economies largely depend on agriculture and animal husbandry. Due to hallucinations, delusions, cognitive deficits, and negative-symptom manifestations, many patients experience inattention, psychomotor slowing, and impaired judgment, rendering them ill-suited for repetitive, fine-motor agricultural tasks such as plowing, sowing, and harvesting.[28] Nonagricultural opportunities in rural areas are typically concentrated in construction and manufacturing, which demand physical strength and behavioral stability; suitable positions are scarce, leading patients to withdraw rapidly from the production system and lose income.[38] The "acquaintance society" structure further amplifies the impact of social functional impairment: unlike the relative anonymity of urban life, rural production and social life are tightly interwoven within dense kinship–neighbor networks. Atypical behavior during village affairs, mutual aid, or festivals attracts sustained scrutiny and commentary. Some patients curtail social participation for fear of negative judgments, while neighbors may distance themselves to "avoid trouble," progressively shrinking patients' social networks and reinforcing isolation.[39] Compounding this, community-based rehabilitation centers and day-care services are limited, restricting access to systematic social skills and functional training and entrenching disability.[40]

Clan-based social organization and traditional health beliefs constitute core cultural drivers that engender and exacerbate stigma in rural settings—often to a greater extent than in urban communities.[41,42] In many villages, family reputation is central to clan continuity. Mental illness is commonly stigmatized as "madness" or a "family blemish," and patients may even be labeled "inauspicious," deepening psychological trauma. To avoid clan-level pressure and gossip, families may conceal illness and restrict patients' activities. Such "protective isolation" heightens patients' sense of otherness and fosters the internalized belief that they are a burden on the family.[43] Low mental health literacy further propagates stigma. Misconceptions such as "mental illness is incurable" remain widespread, fostering direct social exclusion. Patients may be explicitly excluded from major life-cycle events (eg., weddings, funerals) and encounter derogatory remarks or ostracism in daily interactions. This pervasive marginalization promotes self-stigma, leading patients to avoid treatment and rehabilitation for fear of "exposure," and trapping them in a worsening spiral of shame and isolation.[44]

The findings have important clinical implications for improving QoL in clinically stable patients with schizophrenia in resource-limited rural settings. First, given the mediating role of social functional impairment, interventions that target social participation, such as social prescribing, may be valuable.[45] In rural areas, this could involve leveraging village health stations to organize group activities, including mutual aid groups, farming cooperatives, and skill-building workshops, that facilitate meaningful social engagement. Second, family-based stigma reduction programs are promising.[46] Families are central to rural social networks; educating family members about mental illness and reducing discriminatory language can help mitigate stigma and create a supportive environment. Third, due to limited specialized mental health services in rural areas, task-sharing approaches, such as training village doctors or community health workers to deliver basic psychoeducation, could enhance intervention scalability and sustainability.[47] Future research should evaluate the feasibility of these culturally adapted, resource-sensitive strategies.

Several limitations should be acknowledged. First, the use of the PHQ-9 to assess depressive symptoms may not fully differentiate depression from negative symptoms in schizophrenia, a well-recognized phenomenological overlap. Future studies should consider using the Calgary Depression Scale for Schizophrenia (CDSS) or incorporating measures of negative symptoms (eg., PANSS negative subscale) to better isolate the specific contribution of depression. Second, clinical stability was defined primarily by medication dose stability and clinical judgment, without a standardized symptom-based scale (eg., PANSS). This may have introduced variability in the stability status across participants. Future studies should incorporate validated symptom severity measures to more precisely define clinical stability. Third, we did not systematically assess antipsychotic side effects (eg., sedation, extrapyramidal symptoms), which are known to significantly impact QoL in clinically stable patients. The absence of such measures may have resulted in residual confounding. Future studies should incorporate standardized side-effect rating scales to better capture this dimension. Fourth, all measures were based on self-report, raising the possibility of common method variance and recall bias. Although patients and family members jointly confirmed clinical and behavioral information to enhance accuracy, the cross-sectional self-report nature of the assessment may have inflated correlations due to current mood states. Future research should consider incorporating objective assessments (eg., clinician-rated scales, ecological momentary assessment) to reduce this bias. Fifth, the cross-sectional design limits causal interpretation of the mediation pathways. Although we hypothesized a directional relationship based on the biopsychosocial model, the temporal ordering of depression, social functioning, stigma, and QoL cannot be established from cross-sectional data. The mediation analysis should therefore be interpreted as providing evidence of statistical association consistent with the proposed model, rather than confirming causal mechanisms. Sixth, the hierarchical regression model explained only 21.8% of the variance in QoL. This relatively low R^2 suggests that critical variables are missing from the model, likely including negative symptoms, cognitive function (eg., executive function, working memory), and antipsychotic side effects. The inclusion of these factors in future studies may substantially improve the explanatory power of QoL models in clinically stable patients with schizophrenia. Seventh, the sample was drawn from a single center (Chaohu Hospital, Anhui Medical University), which may restrict generalizability. Future studies should expand sampling across multiple regions and care settings to enhance representativeness. Eighth, we did not examine moderators—such as family support, treatment adherence, or community resource availability—that might alter the strength of the identified mediation pathways. Investigating such moderators could help identify subgroups most likely to benefit from targeted interventions.

Future work should adopt longitudinal designs to delineate causal directions and long-term trajectories among depressive symptoms, social disability, stigma, and QoL; expand sampling across multiple regions and care settings; and incorporate culturally sensitive measures to enhance representativeness. Objective assessments—such as behavioral observations of social functioning and stress-related physiological indices—should be added to reduce bias. Investigating moderators including cognitive functioning and family support could help identify subgroups most likely to benefit. Intervention development should prioritize integrated programs that simultaneously target depressive symptoms, functional rehabilitation, and stigma reduction. Additionally, incorporating biomarkers (eg., inflammatory cytokines, neuroimaging) may elucidate biopsychosocial mechanisms underlying QoL impairment and support multimodal, personalized rehabilitation strategies aimed at optimizing QoL among clinically stable individuals with schizophrenia.

Conclusions

This study demonstrates that social functional impairment and stigma are independent predictors of QoL among clinically stable individuals with schizophrenia and serve as parallel mediators in the statistical model linking depressive symptoms to QoL. These findings highlight the need to move beyond symptom control and adopt a biopsychosocial framework to understand and improve QoL in this population. Targeted interventions addressing these psychosocial predictors may better support recovery and meaningfully enhance overall QoL in clinically stable schizophrenia.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Consent

The study was approved by the Ethics Committee of Chaohu Hospital, Anhui Medical University (approval NO. KYXM-202212-013). All procedures adhered to the principles of the Declaration of Helsinki. Informed consent was obtained from participants involved in the study.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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