

# Focusing on quality of life in the family caregivers of patients with schizophrenia from the perspective of family functioning

## A cross-sectional study

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### Abstract

The study aimed to explore the association between family functioning and quality of life (QOL) in family caregivers of patients with schizophrenia.

Totally 121 family caregivers were surveyed in the cross-sectional study by the self-administration questionnaires about sociodemographic characteristics, family functioning and QOL. Family functioning was evaluated in terms of the family assessment device and the Family Adaptability and Cohesion Evaluation Scale II China Version. QOL was evaluated in terms of TSDHE short-form 12-item health survey, version 2. Multiple regression models were built to explore the association between QOL and family functioning.

A regression analysis showed that poorer physical health of family caregivers was significantly associated with the lower educational level of caregivers, the closer kinship with patients and the multiple episodes schizophrenia. The other regression analysis showed that better family adaptability and affective responsiveness were significantly associated with the better mental health of family caregivers.

Family functioning is associated with mental health rather than the physical health of family caregivers. Psychoeducational intervention could focus on family caregivers with a lower educational level and closer kinship, and those who look after patients with multiple episodes schizophrenia. Further family intervention could focus on family adaptability and affective expression in family caregivers of patients with schizophrenia.

**Abbreviations:** FACES II-CV = family adaptability and cohesion evaluation scale II China version, FAD = family assessment device, MCS = mental component scale, PCS = physical component scale, QOL = quality of life, SD = standard deviation, SF-12 v2 = short-form 12-item health survey, version 2.

**Keywords:** family adaptability and cohesion evaluation scale, family assessment device, family caregivers, quality of life, schizophrenia

Editor: Igor V. Pantic.

NM and JC contributed equally to this work.

The study was supported by the Sichuan Science and Technology Program (grant numbers: 2018SZ0256).

The authors have no conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

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How to cite this article: Meng N, Chen J, Cao B, Wang F, Xie X, Li X. Focusing on quality of life in the family caregivers of patients with schizophrenia from the perspective of family functioning: a cross-sectional study. *Medicine* 2021;100:5 (e24270).

Received: 9 January 2020 / Received in final form: 25 November 2020 / Accepted: 11 December 2020

<http://dx.doi.org/10.1097/MD.00000000000024270>

## 1. Introduction

Schizophrenia, a severe mental disorder, is characterized by disturbances in multiple mental modalities, including perception, thinking, self-experience, cognition, affect, volition, and behaviors.<sup>[1]</sup> It is acknowledged that schizophrenia is a chronic disorder requiring long-term treatment and rehabilitation. With the transition from hospital-based care to community-based care, family caregivers play a more important role in the rehabilitation of patients with schizophrenia.<sup>[2]</sup> Family caregivers take responsibility for providing emotional and economic support, supervising medication intake, maintaining treatment compliance, and promoting social interaction.<sup>[3,4]</sup> Compared without the patient without the family caregiver, the patient with the family caregiver showed a lower rate of homeless and a higher rate of survival.<sup>[5]</sup> However, family caregivers of patients with schizophrenia experienced poor quality of life (QOL) resulting from caregiving.<sup>[6,7]</sup> QOL refers to subjective life-satisfaction and well-being as well as objective health status and social interactions.<sup>[8]</sup> As we expected, the poor caregiver's QOL is not beneficial to the patient's rehabilitation. A research also confirmed that the caregiver's QOL affected the patient's psychotic symptoms and QOL.<sup>[9]</sup> Therefore, in recent years researchers have paid more attention to caregiver's QOL.<sup>[10–12]</sup>

In order to improve the caregiver's QOL, many researches have explored the factors of the caregiver's QOL, including the caregiver's highest educational level,<sup>[13]</sup> the caregiver's kinship with the patient,<sup>[14]</sup> stigma,<sup>[15]</sup> the caregiver's perception of the patient's cognitive deficit,<sup>[10]</sup> perceived social support,<sup>[6]</sup> and caregiving burden.<sup>[16]</sup> However, reviewing previous literatures, we find that few studies focus on the caregiver's QOL from the perspective of the whole family.

In China, the family can be a considerable factor associated with QOL among family caregivers. For 1 thing, the Chinese Confucian culture emphasizes a family, not an independent person.<sup>[17]</sup> Family members are advocated to function and interact consistently as a cohesive unit.<sup>[18]</sup> Encouraging family harmony and the care of impaired relatives results in a strong sense of belonging and self-sacrifice among family members.<sup>[2]</sup> During the influence of the family-focused culture, the parent, spouse, or child were the major types of family caregivers.<sup>[2,19]</sup> For the other thing, a family member suffering from schizophrenia would bring a lot of changes in the whole family.<sup>[20]</sup> Family functioning was impaired in a family with 1 family member suffering from schizophrenia.<sup>[21]</sup> Family functioning, as a metric of the whole family status, a multiple concept, is defined as family members' ability to carry out family roles, deal with family problems, adapt to new family routines and procedures, effectively communicate with each other, and maintain cohesive relationships with each other.<sup>[22]</sup> In addition, previous studies have revealed that caregivers benefited from better family functioning in other diseases. Improving family communication and cohesion enhanced QOL of the spouse of survivals with cancer.<sup>[23]</sup> Worse family functioning was associated with more stress and poorer QOL in parents of children with high functioning autism or Asperger syndrome.<sup>[24]</sup> Family functioning is seldom regarded as a factor of QOL in family caregivers of patients with schizophrenia. Therefore, it is significant to explore the association between family functioning and QOL in family caregivers of patients with schizophrenia in China.

As mentioned above, family functioning is a multiple concept. However, the majority of the previous studies about family functioning center on a single dimension such as high expressed emotion in psychosis. A systemic review suggested that further studies should evaluate family functioning from a broader view such as family cohesion and adaptability.<sup>[25]</sup> Moreover, The family assessment device (FAD), developed from the McMaster Model of Family Functioning, is also a multidimensional tool assessing family functioning.<sup>[26]</sup> What more, few studies focus on FAD or family cohesion and adaptability from the perception of caregivers of patients with schizophrenia.

Therefore, we conducted a cross-sectional study to investigate QOL and family functioning from a broader view in family caregivers of patients with schizophrenia. We put forward the hypothesis: family functioning is positively associated with QOL in family caregivers of patients with schizophrenia.

## 2. Methods

### 2.1. Participants

The cross-sectional study recruited 147 caregivers of patients with schizophrenia for 6 months (July 2018 to December 2018) at the Mental Health Center of a tertiary hospital by convenience sampling. The caregivers met the following criteria:

- (1) the family caregivers of patients diagnosed with schizophrenia by 10th version of International Classification of Diseases,
- (2) taking care of patients over 3 months,
- (3) informed consent and
- (4) fluency in Mandarin.

Participants were excluded if they met the following criteria:

- (1) the professional or social worker who voluntarily assisted in daily life and
- (2) suffering from mental disorders or pregnancy.

The diagnoses were made by the psychiatric doctors, working in the Mental Health Center, according to the neuropsychiatric interview. This study has been complied with all the relevant national regulations, institutional policies and the tenets of the Helsinki Declaration, and has been approved by the Ethics Committee of a tertiary (No.259, in 2018). Informed consent has been obtained from all individuals included in this study. The sample size was calculated by nQuery website according to the methods of multiple linear regression, setting  $\alpha=0.05$ , the number of variables=22,  $R^2=0.2$ <sup>[27,28]</sup> and power = 85%. The sample size was 115. Besides the possible 20% loss, the final calculated sample size was 138.

### 2.2. Measures

**2.2.1. Sociodemographic characteristics.** A self-administered questionnaire was used to investigate the characteristics of patients and their caregivers. The characteristics of patients included gender, age, the duration of schizophrenia, and the number of episodes. The characteristics of caregivers included gender, age, the kinship with the patient, marital status, the highest educational level, work status, religion, family monthly income, insurance.

**2.2.2. FAD.** FAD, a 60-item self-reported scale, developed from the McMaster model of family functioning, is widely used to assess family functioning.<sup>[29]</sup> It contains 7 dimensions: problem solving (6 items), communication (9 items), roles (11 items), affective responsiveness (6 items), affective involvement (7 items), behavior control (9 items) and general functioning (12 items).<sup>[30]</sup> Problem solving refers the ability of the family to resolve problems; communication refers to the ability of exchanging information in the family; Role refers to how the family allocate responsibilities within the family; affective responsiveness refers to whether family members experience and respond appropriately with effective emotions; affective involvement refers to the family's way to be interested in each other; behavior control refers to the ability of family members to set rules or standard behaviors; general functional refers to the overall general functioning.<sup>[30]</sup> Each item is scored on a scale from 1 to 4. Each dimension score is calculated by adding the relative item scores. The lower score represents better family functioning. The reliability and validity of the Chinese FAD have been demonstrated. Cronbach's alpha coefficient of all dimensions were 0.53 to 0.94 and test-retest reliability of all dimensions were 0.53 to 0.81.<sup>[31]</sup>

**2.2.3. The family adaptability and cohesion evaluation scale II, China version (FACES II-CV).** FACES II-CV, a 30-item self-reported scale, developed from the McMaster model of family functioning, is widely used to assess family cohesion (16 items) and family adaptability (14 items).<sup>[32,33]</sup> Family cohesion refers to bonds among family members and the degree of family

members' support and interactions; family adaptability refers to the ability of family members to adapt change or stressors.<sup>[34]</sup> Each item is scored on a 1 to 5 Likert format. A lower score indicates poorer family cohesion and adaptability. The FACES II-CV has been confirmed by a good internal consistency (0.73–0.85) and test-retest reliability (0.84–0.91) in the Chinese population.<sup>[17]</sup>

**2.2.4. The short-form 12-item health survey, version 2 (SF-12 v2).** The SF-12 v2, developed by Ware, is widely used to evaluate health-related QOL in general populations over the past 4 weeks.<sup>[35]</sup> The SF-12 v2 consists of the physical component scale (PCS) and mental component scale (MCS). PCS refers to physical health; MCS refers to mental health.<sup>[35]</sup> The scale is scored on a norm-based method with a population mean of 50 and a standard deviation of 10.<sup>[35]</sup> A higher standard score refers to a better health status. In Chinese population, Cronbach's alpha coefficient of PCS and MCS were 0.84 and 0.72, respectively.<sup>[36]</sup>

### 2.3. Data collection and analysis

Researchers were uniformly trained to obtain informed consent and collect data. Researchers gave out questionnaires to caregivers and carefully explained items if they could not understand during the hospitalization of their relatives. Statistical Package for the Social Sciences version 21 was adopted as the analysis device. Researchers abandoned incomplete responses with blank more than 20% of the whole questionnaires. Sociodemographic characteristics were described by mean and standard deviation ( $M \pm SD$ ), median and interquartile range ( $P_{25}, P_{75}$ ) or frequency and proportion ( $n, \%$ ). FAD, FACES, and SF-12 v2 was described by  $M \pm SD$ . One-way ANOVA was used to test the difference of the scores of PCS and MCS according to sociodemographic characteristics. Pearson correlation analysis and Spearman correlation analysis were applied to explore the relationships among sociodemographic characteristics, family functioning and QOL. Two stepwise linear regression models were adopted to identify the independent factors of QOL in family caregivers of patients with schizophrenia. The dependent variables were PCS and MCS. The independent variables of the 2 models were same, including subscales of FAD and FACES, and all characteristics of patients as well as caregivers. The kinship with the patient and the marital status were set as dummy variables. A  $P$ -value of .05 or less referred to statistical significance.

### 3. Results

A total of 23 participants refused to fill in questionnaires resulting from lots of items. Three participants were excluded because of incomplete information. Finally, 121 family caregivers accomplished the whole questionnaires.

Sociodemographic characteristics were described in Table 1. Most family caregivers were female. Family caregivers mainly consisted of the parent. Table 1 also showed the scores of PCS and MCS according to different sociodemographic characteristics. Compare with male caregivers, female caregivers showed a lower score of MCS. The score of PCS was significantly different in caregivers with varied incomes. The subscale scores of FAD, FACES II-CV, and SF-12 v2 were shown in Table 2.

The relationships between sociodemographic characters and SF-12 v2 were shown in Table 3. The age of the patient and the number of episodes were negatively associated with the

caregiver's score of PCS. The highest education level and the income of the caregiver were positively related to the caregiver's score of PCS. The age of the caregiver and the highest education level of the caregiver were positively associated with the caregiver's score of MCS. The gender of the caregiver is negatively related to the caregiver's score of MCS. The relationships among domains of FAD, FACES, and SF-12 v2 were explored in Table 4. There was no significant association among PCS and subscale of FAD and FACES. Except for problem solving, all subscales of FAD and FACES were significantly associated with MCS.

Independent factors of PCS and MCS were shown in Table 5. The highest educational level of family caregivers, the kinship with patients and the patient's number of episodes accounted for a significant 9.6% of the variance in PCS. Family caregivers with a higher educational level were associated with a higher score of PCS ( $\beta = 0.20, P = .026$ ). Compared with the parent, child and spouse, family caregivers with other kinship, such as the sibling, showed a higher score of PCS ( $\beta = 0.18, P = .049$ ). More number of episodes was associated with a lower score of PCS of the family caregiver ( $\beta = -0.22, P = .032$ ). Family adaptability and affective responsiveness were the significant factors of MCS, which explained 15% ( $P < .001$ ) of the variance in MCS. Adaptability was positively associated with the score of MCS ( $\beta = 0.24, P = .021$ ). Affective responsiveness was negatively associated with the score of MCS-12 ( $\beta = -0.23, P = .032$ ).

### 4. Discussion

The study explored the association between QOL and family functioning from a broader view in family caregivers of patients with schizophrenia. The results partly verified the hypothesis in the introduction: family functioning was positively associated with mental health in family caregivers of patients with schizophrenia; family functioning was not related to physical health in caregivers of patients with schizophrenia. We also found that several sociodemographic characteristics of patients or caregivers, family affective responsiveness and family adaptability were the independent factors of QOL in family caregivers.

Our study found that subscales of family functioning, including communication, roles, affective responsiveness, affective involvement, behavior control, general functioning, cohesion, and adaptability, were significantly associated with the mental health of family caregivers from the bivariate correlation analysis. However, family functioning was not significantly associated with the physical health of family caregivers from the bivariate correlation analysis. The result was in agreement with a study focused on family caregivers of patients with type 2 diabetes.<sup>[37]</sup> However, the result was not consistent with another study in which family functioning was significantly associated with not only physical health but also mental health in family caregivers of children with autism or Asperger syndrome.<sup>[24]</sup> The possible reasons for the discrepancy were the detection power, the use of the World Health Organization QOL Questionnaire, brief version to measure QOL.<sup>[24]</sup> In our study, the mean of PCS and MCS were 46.90 ( $SD = 7.15$ ) and 41.74 ( $SD = 10.06$ ), respectively. The score of PCS was nearer to the norm score compared with the score of MCS. Family caregivers showed a more normal or better physical health whether their family functioning was functional or dysfunctional. It was difficult to detect the association between family functioning and physical health in the study. In addition, family functioning, focusing on

**Table 1**  
**Sociodemographic characteristics as well as related physical summary scale and mental summary scale of patients and caregivers (n=121).**

Characteristics	n (%)	PCS (M±SD)	F	P	MCS (M±SD)	F	P
Characteristics of patients							
Gender							
Male	61 (50.41)	46.46±6.67	0.46	.50	41.98±9.40	0.07	.79
Female	60 (49.59)	47.35±7.64			41.49±10.76		
Age (yr)*	27.21±10.35						
Duration (yr)†	2 (0.75, 7.00)						
The Number of episodes†	2 (1, 3)						
Characteristics of caregivers							
Gender							
Male	45 (37.19)	48.41±7.14	3.45	.07	44.35±10.21	4.06	.05
Female	76 (62.81)	45.89±7.12			40.58±9.64		
Age (yr)*	49.08±10.76						
Kinship with the patient							
Parent	99 (81.81)	46.81±6.84	2.36	.08	41.81±9.32	0.40	.76
Child	2 (1.65)	40.11±9.81			47.29±0.54		
Spouse	12 (9.92)	45.03±6.90			40.27±14.09		
Others	8 (6.62)	52.08±8.45			43.86±12.38		
Marital status							
Unmarried	4 (3.31)	51.6±12.82	0.82	.44	47.11±9.10	1.09	.34
Married	107 (88.43)	46.94±6.97			41.73±10.07		
Divorced or widowed	10 (8.26)	47.13±5.97			45.46±8.32		
Highest educational level							
Elementary school	23 (19.00)	44.8±6.52	1.70	.16	39.80±9.24	1.98	.10
Junior high school	34 (28.10)	46.10±7.65			39.25±8.47		
High school	19 (15.70)	46.69±6.00			45.19±11.6		
Junior college	25 (20.66)	48.22±6.83			41.67±10.84		
College or above	20 (16.54)	49.96±7.22			45.46±9.09		
Work status							
Employed	87 (71.90)	47.22±6.49	0.76	.38	41.50±9.62	.40	.53
Unemployed	34 (28.10)	45.91±8.57			42.82±10.91		
Religion							
Yes	16 (13.22)	49.76±8.19	3.18	.08	43.12±8.73	.29	.59
No	105 (86.78)	46.34±6.97			41.67±10.20		
Family monthly income (RMB)							
≤3000	42 (34.71)	44.17±7.03	3.26	.01	39.24±10.31	1.05	.38
3001–6000	41 (33.88)	48.54±6.21			42.84±10.17		
6001–8000	11 (9.09)	51.13±5.12			43.85±13.34		
8001–10000	9 (7.44)	46.83±8.09			44.15±8.44		
>10000	18 (14.88)	47.00±8.26			42.57±7.17		
Insurance							
Yes	84 (69.42)	46.54±7.24	1.10	.30	41.84±10.15	0.11	.75
No	37 (30.58)	48.01±6.79			41.19±9.90		

MCS = mental summary scale, PCS = physical summary scale.

\* items were described by M±SD.

† items were described by Median ( $P_{25}$ ,  $P_{75}$ ).

psychosocial aspects, may have a closer association with mental health than physical health. Several researchers indicated that family functioning was negatively associated with family burden, stigma, anxiety, and depression.<sup>[38,39]</sup> These negative psychological reactions have a more impact on caregivers' mental health than physical health. Our result revealed the association between family functioning and mental health of family caregivers. The result suggests that improving family functioning by family intervention programs could be beneficial to mental health in family caregivers of patients with schizophrenia.

An important finding was that family caregivers with higher family adaptability showed better mental health. The result was similar to the previous study conducted in caregivers of patients with severe brain injuries.<sup>[40]</sup> Family adaptability refers to the

ability of family members to adapt to change or stressors.<sup>[34]</sup> After suffering from schizophrenia, family caregivers would face various stressors, such as the patient's self-injury and violence behaviors, non-compliance behaviors, and stigma. The stressors make a great challenge to family caregivers. High adaptability was correlated with adaptive coping strategies<sup>[41]</sup> and positive caregiver appraisals,<sup>[42]</sup> which make it more easily for caregivers to deal with the challenge. Additionally, family adaptability was positively correlative with emotional support as family members perceived.<sup>[43]</sup> More emotional support is beneficial to the mental health of caregivers. Therefore, family caregivers with higher family adaptability perform with better mental health. The result suggests that family adaptability should be enhanced in family caregivers of patients with schizophrenia. A study pointed out

**Table 2**  
**The outcome of the Family assessment device, the family adaptability and cohesion evaluation scale and the short-form 12-item health survey, version 2 in family caregivers (n = 121).**

Subscale	M ± SD
FAD	
Problem solving	12.98 ± 2.75
Communication	20.31 ± 4.15
Roles	26.41 ± 3.51
Affective responsiveness	14.34 ± 2.77
Affective involvement	16.83 ± 3.22
Behavior control	21.30 ± 2.82
General functioning	25.61 ± 4.61
FACES	
Cohesion	61.51 ± 10.14
Adaptability	46.90 ± 7.15
SF-12 v2	
PCS	46.90 ± 7.15
MCS	41.74 ± 10.06

FACES = the family adaptability and cohesion evaluation scale, FAD = the family assessment device, MCS = mental summary scale, PCS = physical summary scale, SF-12 v2 = the short-form 12-item health survey, version 2.

dysfunctional family adaptability in caregivers of patients with schizophrenia.<sup>[42]</sup> Coping skills training intervention had a positive effect on QOL of caregivers with psychiatric patients.<sup>[44]</sup> Another study also revealed that a manual-guided, problem-solving-based self-learning program for family caregivers could decrease family burden.<sup>[45]</sup> However, there are few studies to directly intervene in family adaptability in family caregivers of patients with schizophrenia. Further studies could develop family adaptability intervention program to enhanced family caregivers' QOL.

Another important finding was that family caregivers with better affective responsiveness showed better mental health. Few

previous studies have been found in this relationship. There were several possible reasons. Affective responsiveness refers to the ability of family members to respond appropriately to different affective experiences within the family.<sup>[46]</sup> Compared with European Americans, Chinese pay less attention to emotional expression.<sup>[47]</sup> Instead of an adaptive affective expression, Chinese culture advocates emotion suppression about negative emotions to preserve interpersonal harmony.<sup>[48]</sup> Emotional suppression decreased life satisfaction as well as the important part of QOL.<sup>[49]</sup> Compared with caregivers with worse affective responsiveness, caregivers with better affective responsiveness could express negative emotion properly, which promote their mental health.<sup>[50]</sup> In addition, family caregivers with better affective responsiveness can get more emotional support, named the love and warmth from other family members. Emotional support is an important part of social support, which enhanced the mental health of caregivers.<sup>[51]</sup> According to the association between affective responsiveness and mental health of family caregivers, clinical staff should promote adaptive affective responsiveness in the family with schizophrenia. A previous study revealed brief multifamily psychoeducation for family members could improve affective responsiveness in caregivers of patients with chronic major depression.<sup>[52]</sup> Another study showed that expressive writing intervention improved QOL Life among breast cancer survivors.<sup>[53]</sup> Therefore, as an educator and health manager, clinic staff could provide knowledge and skills related to emotional expression and regulation for family members to improve their mental health.

In addition, sociodemographic characteristics were significantly associated with the mental and physical health of caregivers with schizophrenia in our study. The results from bivariate correlation analyses were not completely consistent with the results from regression models, which showed that there are confounding factors influencing the correlations. The regression models controlled the confounding factors and showed several

**Table 3**  
**Correlations coefficients between sociodemographic characters and the short-form 12-item health survey, version 2.**

Scales	Sociodemographic characters of patients				Sociodemographic characters of caregivers								
	Gender	Age	Duration	The Number of episodes	Gender	Age	Kinship	Marital status	Education	Work status	Religion	Income	Insurance
SF-12 v2													
PCS	.06	-.22*	-.08	-.19*	-.16	-.18	.02	-.06	.21*	.05	-.18	.19*	.10
MCS	-.03	.16	.06	.01	-.21*	.26**	.02	.05	.20*	-.05	-.08	.15	-.02

MCS-12 = mental summary scale, PCS = physical summary scale, SF-12 v2 = the short-form 12-item health survey, version 2.

\* P < .05.  
 \*\* P < .01.  
 \*\*\* P < .001.

**Table 4**  
**Correlation coefficients among family assessment device, the family adaptability and cohesion evaluation scale, the short-form 12-item health survey, version 2.**

Scales	FAD							FACES	
	Problem Solving	Communication	Roles	Affective Responsiveness	Affective Involvement	Behavior Control	General Functioning	Cohesion	Adaptability
SF-12 v2									
PCS	-.02	.02	-.14	-.10	-.17	-.03	-.09	.09	.09
MCS	-.17	-.27**	-.29**	-.35***	-.26**	-.26**	-.30**	.30**	.36***

FACES = the family adaptability and cohesion evaluation scale, FAD = family assessment device, MCS-12 = mental summary scale, PCS = physical summary scale, SF-12 v2 = the short-form 12-item health survey, version 2, SCLs = schizophrenia quality of life scale.

\*\* P < .01.  
 \*\*\* P < .001.

**Table 5**  
**Significant influence factors of quality of life in caregivers of patients with schizophrenia.**

Influence factors	B	SE (B)[95%CI]	$\beta$	P	$R^2$	$\Delta R^2$	F for $\Delta R^2$
PCS					.119	.096	5.25**
Highest educational level of caregiver	1.09	0.48[0.13, 2.03]	.20	.026			
Kinship with the patient <sup>a</sup>	5.17	2.60[-0.02, 10.32]	.18	.049			
Numbers of episodes	-0.75	0.30[-1.35, -0.14]	-.22	.015			
MCS					.167	.153	10.63***
Adaptability	0.28	0.12[0.04, 0.52]	.24	.021			
Affective responsiveness	-0.82	0.38[-1.57, -0.07]	-.23	.032			

MCS = mental summary scale, PCS = physical summary scale.

<sup>a</sup>reference category = parent, child, and spouse.

\*\*  $P < .01$ .

\*\*\*  $P < .001$ .

sociodemographic characteristics independently correlative with caregivers' physical and mental health. Family caregivers who were less educated experienced poorer health-related QOL, which is in agreement with previous studies.<sup>[11,51]</sup> Similar to another study,<sup>[14]</sup> family caregivers with closer kinship such as the parent, spouse or child showed better physical health than family caregivers with other kinship such as the sibling. Our study also found that physical health would be worse in family caregivers of patients with more numbers of episodes. Few studies focus on this relationship. More qualitative studies might be conducted to explore the reason. Compared with family caregivers of first-episode patients, family caregivers of multiple-episode patients spend longer time and energy taking care of patients leading to poorer physical health. Moreover, relapsing patients reported more negative symptoms than first-episode schizophrenia.<sup>[54]</sup> Patients with multiple episodes schizophrenia usually adopt negative cope strategies than that of patients with first-episode schizophrenia.<sup>[55]</sup> Caregivers may need spending more time encouraging patients to keep daily life and even assist them directly, which impaired caregivers' physical health. In addition, multiple-episode patients were more likely to achieve lower remission rates and higher treatment resistance rates.<sup>[56]</sup> Hence, family caregivers may feel more difficult to look after their patients because of the bad outcome, which impaired physical health. In our studies, 72.8% of family caregivers received education below junior college. It confirmed that the educational level was low in the majority of caregivers of patients with schizophrenia.<sup>[57]</sup> Additionally, up to 93.38% of family caregivers were the parent, spouse or child in our study. The results suggest that clinical staff should pay more attention and provide more supports to family caregivers with a lower educational level, closer kinship and those who take care of patients with multiple episodes schizophrenia.

Several limitations must be considered in interpreting our findings. Firstly, the small sample of participants from 1 tertiary hospital is short of generalizability. Further study could recruit more representative and larger samples. Secondly, the study only briefly investigated patients' sociodemographic characteristics and illness information. Further study could add illness-related characteristics such as symptoms severity in detail. Finally, the cross-sectional study only demonstrates the correlation between family functioning and mental health. Meanwhile, there is a limited contribution of family functioning to QOL of family caregivers in our study. A possible reason is that QOL is a multiple concept associated with many factors.<sup>[58]</sup> Further prospective cohort studies are needed to explore the effect of

family functioning on QOL in family caregivers of patients with schizophrenia.

The study reveals the relationship between family functioning and QOL of family caregivers of patients with schizophrenia. Moreover, this study has provided significant evidence that family adaptability and affective responsiveness are positively associated with mental health in family caregivers of patients with schizophrenia. In addition, the study confirms that the caregivers' highest educational level, their kinship with patients and patients' number of episodes are independently associated with QOL of caregivers. These results have significant implications for family intervention in family caregivers of patients with schizophrenia. Clinical staff could provide more support to family caregivers characterized by low educational level, close kinship (such as parents, children and spouse) and those who take care of patients with multiple episodes schizophrenia. Most of all, clinical staff could attach importance to family adaptability and affective responsiveness to improve QOL in family caregivers of patients with schizophrenia.

### Acknowledgment

We are thank to all participants in the study. We thank the statistical support from professor Guanjian Liu. Specially thanks to the whole staff in the Mental Health Center of the tertiary hospital.

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