Article

Mental Health and Quality of Life in Chronic Kidney Disease Patients with Mild-to-Moderate Depression: A Retrospective Cohort Study of Mindfulness-Based Stress Reduction Therapy

Xiumei Li[1]
Wei Gao[2]
Jie Yu[1]
Yanling Mao[1]
Haihong Gu[1]
Fang Li[1]
Dongmei Ren[3,*]

[1]Nephrology Internal Department, Jiading District Central Hospital Affiliated Shanghai University of Medicine & Health Sciences, 201800 Shanghai, China
[2]Emergency Department, Jiading District Central Hospital Affiliated Shanghai University of Medicine & Health Sciences, 201800 Shanghai, China
[3]Nursing Department, Jiading District Central Hospital Affiliated Shanghai University of Medicine & Health Sciences, 201800 Shanghai, China

Abstract

Background: Chronic kidney disease (CKD) patients may experience pessimism, and even despair, due to long-term nature of the condition, which increases the risk of depression. Mindfulness-based stress reduction (MBSR) can relieve depression. This retrospective cohort study aimed to investigate the effects of MBSR on mental health and quality of life in CKD patients with mild-to-moderate depression, so as to provide guidance for clinical nursing programs.

Methods: The clinical data of 100 CKD patients with mild-to-moderate depression who were treated in Jiading District Central Hospital Affiliated Shanghai University of Medicine & Health Sciences from January 2021 to March 2023 were retrospectively analyzed. Based on nursing method received, the patients were divided into the conventional group (conventional management) and the MBSR group (MBSR therapy was implemented in addition to conventional management). After matching, there were 35 cases in each group. The scores for the self-rating depression scale (SDS), Connor-Davidson Resilience Scale (CD-RISC), Five-factor Mindfulness Questionnaire (FFMQ), Pittsburgh Sleep Quality Index (PSQI), and 36-item Short Form Health Survey (SF-36) were compared between the two groups.

Results: After management, the SDS and PSQI scores of the MBSR group were lower than those of the conventional group, and the CD-RISC, FFMQ and SF-36 scores were higher than those of the conventional group ($p < 0.05$).

Conclusion: MBSR can improve the mental health, sleep quality, and quality of life of CKD patients with mild-to-moderate depression, and improve psychological resilience and mindfulness.

Keywords

mindfulness; kidney diseases; chronic; depression; mental health; quality of life

Background

Chronic kidney disease (CKD) is caused by progressive, pathological changes in kidney structure and function. Relevant surveys have found [1] that the prevalence of CKD is 9.1% worldwide. Another survey found [2] that the incidence of CKD in China is 8.2%, and the prevalence has been increasing in recent years, which has seriously threatened people's lives and health. Depression is an emotional disorder linked to both genetic and environmental factors. It can be divided into mild, moderate, or severe depression. Relevant surveys have found [3] that the incidence of depression is 0.4%–34.1% worldwide. CKD patients are at high risk of depression, and the incidence of depression in such patients is as high as 69% [4]. The study by Anthony D'Oro *et al.* [5] showed that depression is an independent risk factor for cardiovascular disease in CKD patients, which directly af-

*Corresponding author details: Dongmei Ren, Nursing Department, Jiading District Central Hospital Affiliated Shanghai University of Medicine & Health Sciences, 201800 Shanghai, China. Email: rendongmei1222@163.com

fects their prognosis. Therefore, it is of great importance to take effective management measures for CKD patients with mild-to-moderate depression.

Mindfulness-based stress reduction (MBSR) was proposed by Dr. Kabat-kin in 1979 [6]. MBSR encourages patients to adopt inner strength to cultivate mindfulness, so as to exert positive health effects. As a psychological management method, MBSR has been proved by clinical studies to improve mental health [6] and has a good therapeutic effect on depression [7]. However, research on the effects of MBSR on mental health and quality of life (QOL) in CKD patients with mild-to-moderate depression is still relatively limited.

The main objective of this study was to investigate the effects of MBSR on mental health and QOL in CKD patients with mild-to-moderate depression. Specifically, we aimed to analyze the changes in mental health and QOL, before and after the application of MBSR, through a retrospective cohort study. A deeper understanding of the effects of MBSR is expected to provide more effective management options for CKD patients with mild-to-moderate depression, promote their physical and mental recovery, and provide guidance for clinical practice.

Materials and Methods

General Information

Clinical data of 100 CKD patients with mild-to-moderate depression admitted to Jiading District Central Hospital Affiliated Shanghai University of Medicine & Health Sciences from January 2021 to March 2023 were retrospectively analyzed, and the patients were divided into the routine group (conventional management) and the MBSR group (MBSR therapy was implemented in addition to conventional management). Inclusion criteria were: (1) Patients with stage 3–4 CKD diagnosed by nephrologists with physician qualification and attending physician or above, referring to the diagnostic criteria in the "Practical Guide for the Diagnosis and Evaluation of Chronic Kidney Disease for Non-nephrologists" [8]. Stage 4 CKD: glomerular filtration rate 10-30 mL/min; (2) Age $\geq$18 years old; (3) Patients with mild-to-moderate depression diagnosed by psychiatrists with medical practitioner qualification and attending physician or above. All patients were in stable condition, had no cognitive impairment, and had a self-rating depression scale (SDS) [9] score >53; (4) Patients with complete clinical and follow-up data. Exclusion criteria: (1) Patients who lacked self-care ability and basic reading and writing ability; (2) Those who had recently undergone major surgery or had the intention of transferring hospitals; (3) Patients with tumors or other serious diseases; (4) Patients with history of use of antidepressants and anti-anxiety drugs; (5) In addition to the diagnosis and treatment of CKD, patients that also had other serious, recent personal issues, such as divorce, unemployment, and death of relatives.

Grouping Method

Conventional Group

(1) Routine psychological support: Routine psychological support was provided, such as psychological counseling, psychological treatment, etc., to help patients alleviate mental health problems. This included assessing the patient's degree of depression, providing antidepressant medication as prescribed, and conducting targeted psychological counseling. Patients were encouraged to listen to music, watch TV and engage in other diversions to maintain an optimistic mood; (2) Disease education: Relevant knowledge and self-management education about chronic kidney disease were provided to improve patients' awareness and coping ability; (3) Regular follow-up: Regular follow-up of patients was conducted to monitor changes in condition and to provide necessary medical advice and support; (4) Drug treatment: According to the specific situation of the patient, drugs were prescribed following the doctor's advice.

MBSR Group

In addition to conventional management, the MBSR group implemented MBSR therapy as follows: (1) Set up an MBSR group; The members included 1 physician, 1 head nurse, 1 psychological consultant and 6 senior nurses, among which the physician was responsible for the assessment of the patient's condition and the formulation of treatment plans; Psychological counselors were responsible for listening to and answering patients' psychological doubts; Since the head nurse was the group leader, it was necessary to carry out MBSR training for nurses, and assessment was conducted after the training. Only those who passed the examination were eligible, to ensure that all members could skillfully apply the relevant theories and management measures of MBSR, and formulate appropriate management plans after discussion. (2) On the first day after admission, the nurse familiarized patients and their families with the methods and significance of MBSR. The main forms of education involved one-on-one oral education, written materials, answering questions, and watching and sharing videos and background music about MBSR treatment, in order to

improve the understanding of the patients and their families on the MBSR intervention therapy; (3) Starting from day 2, each patient needed to receive MBSR therapy at least 4 times, as follows: ① The first time: Mindful breathing. Guide the patient to remain supine with eyes closed, to place one hand on the abdomen, and to maintain physical and mental relaxation under the verbal guidance and suggestion of the medical staff. Guide the patient to remain consciously aware of the ups and downs of the abdominal wall during their breathing, to fully perceive the flow of breath in the body, and to perceive and accept all current emotions; ② The second time: Walking meditation. The guide language is used to actively assist the patient in reaching the meditative state during walking. Each step needs to focus attention, and the patient should feel and experience all the movements of the foot when lifting and landing, and feel the feeling of contact and friction between the foot and the ground. If there are negative emotions, do not evaluate and analyze them, and actively guide patients to release their inner emotions; ③ The third time: Body scan. Guide the patients to adopt a comfortable supine position or sitting position, and to slowly relax the body according to the relaxed and soothing background music and guidance words, starting from the toes, and slowly moving up to the top of the head, with eyes closed and experiencing the feeling of different parts during relaxation. If there is a special psychological feeling, they can feel it with their heart until the special feeling completely disappears; ④ The fourth time: Raisin practice. Distribute the cleaned raisins to the patients, and the patients will focus on the color, shape, and taste of the raisins with the instructions. If there are other uncontrolled thoughts, the attention can be pulled back; ⑤ The fifth time: Repeat the training of mindful breathing and walking meditation; ⑥ The sixth time: Repeat body scanning training and raisin eating exercises, and discuss the problems during the training until the patient can master them.

The treatment was performed once a day, the treatment environment was kept quiet, the single treatment time was 30–40 minutes, and the treatment was carried out continuously for 6 days. If the treatment frequency was insufficient due to various reasons, supplementary treatment was carried out. From the 2nd week to the discharge of the patient, the patient carried out the mindfulness-based decompression treatment by himself, 4–5 times a week, with a single treatment time of 30 minutes. Each time, two kinds of exercises were randomly selected to guide the patient to integrate the treatment into daily life and adhere to it.

Both groups were followed up for 12 weeks.

Observation Indicators

The scores of SDS, Connor-Davidson Resilience Scale (CD-RISC), Five-factor Mindfulness Questionnaire (FFMQ), Pittsburgh Sleep Quality Index (PSQI) and 36-item Short Form Health Survey (SF-36), before and after management, were collected through clinical data and follow-up data.

(1) SDS score: The SDS recommends a scale for use in psychopharmacological studies for the U.S. Department of Education, Health and Welfare, involving 20 items, each item 1–4 points, a total score of 80 points. The critical value is 53 points, a score below 52 points is normal; 53–62 points indicate mild depression, 63–72 points mean moderate depression, and scores above 72 indicate severe depression. Cronbach's α coefficient and content validity were 0.844 and 0.836, respectively. (2) CD-RISC score: It is used to evaluate resilience, involving three dimensions of resilience, optimism, and self-reliance. There are 25 items in total, and each item is scored from 0–4 points, with a total score of 0–100 points. Higher scores indicate greater mental resilience. A score below 60 points is a poor level of mental resilience, 61–69 points indicate a general level of mental resilience, and 70–79 points indicate a good level of mental resilience. Cronbach's α of the scale was 0.916, and the content validity was 0.863 [10]. (3) FFMQ score: The FFMQ is a tool used to measure the level of mindfulness. It involves a total of 39 items, including 5 dimensions of observation, description, conscious action, non-judgment, and non-reaction. Each item is scored on a scale of 1–5, and the total score is 39–195. The content validity was 0.890 [11]. (4) PSQI score: PSQI is used to evaluate the sleep quality of the population. The scale has 18 items, including 7 dimensions: Subjective sleep quality, time to fall asleep, daytime dysfunction, use of hypnotic drugs, sleep efficiency, sleep disturbance, sleep duration, etc., which are scored on a scale of 0–3, and the total score was the sum of each dimension. Higher scores indicate worse sleep quality. The total score ranged from 0–21, with 0–4 indicating good sleep quality, 5–10 moderate sleep quality, and 11–21 poor sleep quality. The Cronbach's α coefficient of the scale was 0.850, and the content validity was 0.813 [12]. (5) SF-36 score: SF-36 is used to evaluate 8 aspects of health-related QOL, including physical functioning, social functioning, role physical, mental health, body pain, role emotional, vitality and general health, a total of 36 items. The scale items were coded first and then scored. The total score of each dimension is 100, and a high score indicates a high QOL. The Cronbach's α coefficient of the scale was 0.890, and the content validity was 0.845 [13].

Table 1. Comparison of general data between the two groups.

Indicators	Before matching				After matching			
	The MBSR Group (n = 40)	The Conventional Group (n = 60)	χ^2/t	p	The MBSR Group (n = 35)	The Conventional Group (n = 35)	χ^2/t	p
Gender (case, %)								
Male	24 (60.00)	19 (31.67)	7.861	0.005	18 (51.42)	17 (48.57)	0.057	0.811
Female	16 (40.00)	41 (68.33)			17 (48.58)	18 (51.43)		
Age (years)	55.30 ± 3.78	54.80 ± 3.85	0.641	0.523	54.75 ± 3.58	54.32 ± 3.46	0.716	0.475
Body mass index (kg/m^2)	20.48 ± 1.22	20.32 ± 1.18	0.655	0.514	20.10 ± 1.20	20.04 ± 1.15	0.214	0.832
Educational level (case, %)								
Junior high school or below	27 (67.50)	40 (66.67)	0.008	0.931	21 (60.00)	20 (57.14)	0.059	0.8080
High school or above	13 (32.50)	20 (33.33)			14 (40.00)	15 (42.86)		
Marital status (case, %)								
Married	27 (67.50)	42 (70.00)	5.914	0.052	22 (62.86)	24 (68.57)	0.265	0.876
Unmarried	8 (20.00)	12 (20.00)			8 (22.86)	7 (20.00)		
Divorced or widowed	5 (12.50)	6 (10.00)			5 (14.29)	4 (11.43)		
Past medical history (case, %)								
Cerebral apoplexy	3 (7.50)	4 (6.67)	0.026	0.873	2 (5.71)	3 (8.57)	0.215	0.643
Coronary heart disease or cardiac event	4 (10.00)	5 (8.33)	0.081	0.775	2 (5.71)	4 (11.43)	0.729	0.393
Hypertension	5 (12.50)	7 (11.67)	0.016	0.900	3 (8.57)	5 (14.29)	0.565	0.452
Diabetes	4 (10.00)	6 (10.00)	0.000	1.000	3 (8.57)	4 (11.43)	0.159	0.690
Other chronic diseases	3 (7.50)	5 (8.33)	0.023	0.880	2 (5.71)	4 (11.43)	0.729	0.393
None								
Creatinine (μmol/L)	215.98 ± 18.42	225.34 ± 20.76	2.309	0.023	218.20 ± 17.55	217.96 ± 18.32	0.056	0.956
Urea nitrogen (μmol/L)	14.24 ± 3.17	16.90 ± 3.45	3.900	0.001	15.80 ± 3.12	16.24 ± 3.25	0.578	0.565
Smoking history	5 (12.50)	8 (13.33)	0.015	0.903	4 (11.43)	6 (17.14)	0.467	0.495
Alcohol consumption	4 (10.00)	6 (10.00)	0.000	1.000	3 (8.57)	5 (14.29)	0.565	0.452
Motion frequency								
Frequently	8 (20.00)	12 (20.00)	0.000	1.000	7 (20.00)	6 (17.14)	2.740	0.254
Occasionally	22 (55.00)	33 (55.00)			20 (57.14)	21 (60.00)		
Never	10 (25.00)	15 (25.00)			8 (22.86)	8 (22.86)		
Social support level								
High	14 (35.00)	24 (40.00)	0.480	0.787	12 (34.29)	14 (40.00)	0.255	0.880
Middle	16 (40.00)	20 (33.33)			15 (42.86)	14 (40.00)		
Low	10 (25.00)	16 (26.67)			8 (22.86)	7 (20.00)		
Medical insurance type (case, %)								
Employee medical insurance or resident medical insurance	29 (72.50)	48 (80.00)	0.762	0.383	24 (68.57)	25 (71.43)	0.068	0.794
Without health insurance	11 (27.50)	12 (20.00)			11 (31.43)	10 (28.57)		
CKD course (years)	5.5 (4,7)	6.5 (4,9)	5.780	0.001	5.0 (4,6)	4.5 (3,6)	0.865	0.214
Course of depression (months)	3 (2,4)	4 (2,6)	7.995	0.001	2.5 (2,3)	3.0 (2,4)	1.256	0.074

MBSR, Mindfulness-based stress reduction; CKD, Chronic kidney disease.

Table 2. Comparison of SDS and CD-RISC scores before and after management between the two groups ($\bar{x} \pm s$, scores).

Group	SDS scores		CD-RISC scores							
			Resilience		Optimism		Self-reliance		Total scores	
	Before management	After management	Before management	After management	Before management	After management	Before management	After management	Before management	After management
The MBSR group (n = 35)	62.46 ± 3.12	52.46 ± 4.20*	30.26 ± 3.88	34.15 ± 3.94*	8.75 ± 1.28	11.16 ± 2.24*	19.40 ± 3.20	22.76 ± 3.38*	56.32 ± 3.15	68.34 ± 6.25*
The conventional group (n = 35)	61.90 ± 3.78	55.64 ± 4.76*	29.94 ± 3.95	32.10 ± 3.75*	8.80 ± 1.35	9.98 ± 1.85*	18.96 ± 3.35	20.64 ± 3.20*	56.90 ± 3.04	63.90 ± 6.14*
t	0.676	2.964	0.342	2.230	0.159	2.403	0.562	2.695	0.784	2.998
p	0.501	0.004	0.733	0.029	0.874	0.019	0.576	0.009	0.436	0.004

Note: SDS, self-rating depression scale; CD-RISC, Connor-Davidson Resilience Scale.

*Indicates a significant difference compared to the value before treatment ($p < 0.05$).

Table 3. Comparison of FFMQ scores between the two groups before and after management ($\bar{x} \pm s$, scores).

Project	Time	The MBSR group (n = 35)	The conventional group (n = 35)	*t*	*p*
Observation	Before management	19.74 ± 2.18	19.35 ± 2.20	0.745	0.459
	After management	20.88 ± 2.36*	22.46 ± 2.40*	2.777	0.007
Description	Before management	19.52 ± 2.22	19.60 ± 2.31	0.148	0.883
	After management	20.68 ± 2.28*	22.34 ± 2.56*	2.865	0.006
Act with awareness	Before management	19.48 ± 2.05	19.56 ± 2.14	0.160	0.874
	After management	20.74 ± 2.12*	22.21 ± 2.48*	2.666	0.010
No judging	Before management	19.62 ± 2.10	19.78 ± 2.32	0.302	0.763
	After management	20.98 ± 2.14*	21.98 ± 2.55*	1.778	0.001
No response	Before management	18.96 ± 2.45	19.06 ± 2.63	0.165	0.870
	After management	21.02 ± 2.30*	22.58 ± 2.76*	2.569	0.012
Total score	Before management	95.60 ± 8.35	95.24 ± 8.48	0.179	0.859
	After management	107.04 ± 8.56*	113.76 ± 9.72*	3.070	0.003

Note: FFMQ, Five-factor Mindfulness Questionnaire.

*Indicates a significant difference compared to the value before treatment ($p < 0.05$).

Statistical Methods

The statistical software IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, NY, USA) was used to analyze the data. Count data were expressed as [n (%)]. If the sample size was ≥40 and the theoretical frequency was $T \geq 5$, the basic formula of chi-square test was used, and the test statistic was χ^2. If the sample size was ≥40 but the theoretical frequency was $1 \leq T < 5$, the correction formula of chi-square test was used. If the sample size was less than 40 or the theoretical frequency T was less than 1, Fisher's exact probability method was used for statistical analysis. The Shapiro-Wilk method was used to test whether the measurement data conformed to the normal distribution. The measurement data that conformed to the normal distribution were represented by ($\bar{x} \pm s$). Non-normal distribution measurement data were expressed as median and quartile [M(P25, P75)], and a non-parametric test was used. p values < 0.05 were considered statistically significant. Gender, age, body mass index, educational level, marital status, past medical history, creatinine, urea nitrogen, smoking history, alcohol consumption, exercise frequency, social support level, type of medical insurance, CKD course, and depression course were selected as covariables, and the management methods of CKD patients with mild-to-moderate depression were taken as dependent variables, and each covariate was independent. The propensity score was calculated by Logistic regression analysis. SPSS25.0 statistical software was used to match the conventional group and MBSR group according to the 1:1 ratio nearest neighbor matching method, and the caliper value was 0.02. The graphics drawing Software is GraphPad Prism 7 (GraphPad Software, San Diego, CA, USA).

Results

Comparison of General Data between the Two Groups

Before matching, there were significant differences in gender, creatinine, urea nitrogen, CKD course, and depression course between the two groups ($p < 0.05$). There was no statistical difference in the basic characteristics of the two groups after matching ($p > 0.05$), as shown in Table 1.

The Changes in SDS and CD-RISC Scores in the MBSR Group before and after Management were Higher than Those in Conventional Group

Before the management, there were no significant differences in SDS scores, or in CD-RISC scores of resilience, optimism, self-reliance, and total scores between the two groups ($p > 0.05$). After the management, the SDS scores of the two groups were decreased ($p < 0.05$), and the CD-RISC scores and total scores were increased ($p < 0.05$), and the SDS score of the MBSR group was lower than that of the conventional group ($p < 0.05$), and the CD-RISC scores and total scores were higher than those of the conventional group ($p < 0.05$). For details, see Table 2 and Fig. 1.

The Change of FFMQ Scores before and after Management in MBSR Group was Higher than That in Conventional Group

Before management, there were no significant differences in FFMQ scores for observation, description, conscious action, non-judgment, or non-reaction between the two groups ($p > 0.05$). After management, the FFMQ scores and total scores of the two groups were higher than before ($p < 0.05$), and the FFMQ scores and total scores of the MBSR group were higher than those of the conventional group ($p < 0.05$). For details, see Table 3 and Fig. 2.

The Change in PSQI Scores before and after Management in the MBSR Group was Higher than That in Conventional Group

Before management, there were no significant differences in PSQI scores for sleep quality, sleep time, fall asleep time, sleep disorder, sleep efficiency, hypnotic drug use, daytime dysfunction, and total scores between the two groups ($p > 0.05$). After management, the PSQI scores and total scores of the two groups were lower than before ($p < 0.05$); Moreover, the PSQI scores and total scores of the MBSR group were lower than those of the conventional group ($p < 0.05$). For details, see Table 4.

The Change in SF-36 Scores before and after Management was Greater in the MBSR Group than in the Conventional Group

Before management, there were no significant differences in SF-36 scores for physical functioning, social function, role-physical, mental health, bodily pain, role-emotional, vitality and general health between the two groups ($p > 0.05$). After the management, the SF-36 scores and total scores of the two groups were higher than before ($p < 0.05$), and the SF-36 scores and total scores of the MBSR group were higher than those of the conventional group ($p < 0.05$). For details, see Table 5.

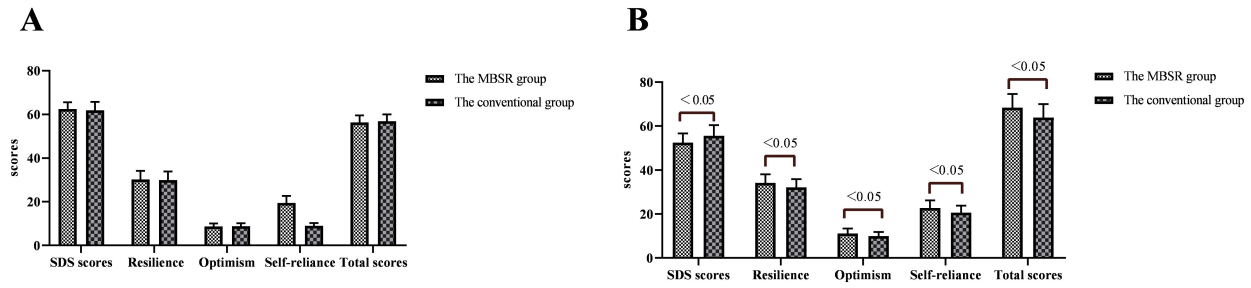

Fig. 1. Comparison of SDS and CD-RISC scores before and after management between the two groups ($\bar{x} \pm s$, scores). (A) The comparison of SDS and CD-RISC scores between the two groups before management. (B) The comparison of SDS and CD-RISC scores between the two groups after management. Note: SDS, self-rating depression scale; CD-RISC, Connor-Davidson Resilience Scale.

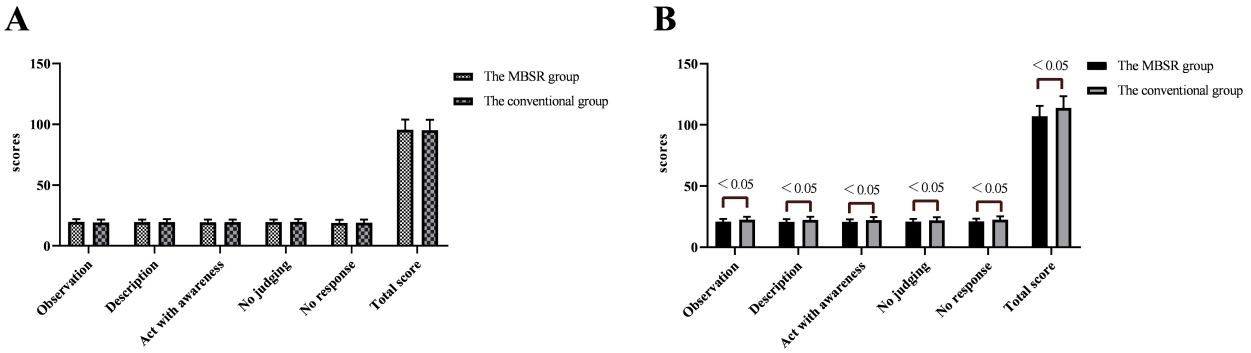

Fig. 2. Comparison of FFMQ scores between the two groups before and after management ($\bar{x} \pm s$, scores). (A) The comparison of FFMQ scores between the two groups before management. (B) The comparison of FFMQ scores between the two groups after management. Note: FFMQ, Five-factor Mindfulness Questionnaire.

Table 4. Comparison of PSQI scores before and after management between the two groups ($\bar{x} \pm s$, points).

Indicators	Time	The MBSR group (n = 35)	The conventional group (n = 35)	*t*	*p*
Sleep quality	Before management	2.30 ± 0.42	2.35 ± 0.40	0.510	0.612
	After management	1.69 ± 0.25*	1.88 ± 0.30*	3.030	0.003
Sleep time	Before management	2.40 ± 0.38	2.52 ± 0.40	1.287	0.203
	After management	1.78 ± 0.12*	1.88 ± 0.20*	2.536	0.013
Fall asleep time	Before management	2.60 ± 0.35	2.58 ± 0.38	0.229	0.820
	After management	1.98 ± 0.30*	2.20 ± 0.35*	2.823	0.006
Sleep disorder	Before management	2.52 ± 0.45	2.50 ± 0.40	0.197	0.845
	After management	1.89 ± 0.28*	2.10 ± 0.32*	2.922	0.005
Sleep efficiency	Before management	2.44 ± 0.45	2.50 ± 0.40	0.590	0.557
	After management	1.80 ± 0.38*	2.05 ± 0.42*	2.611	0.011
Hypnotic drug use	Before management	2.65 ± 0.22	2.70 ± 0.25	0.888	0.378
	After management	1.92 ± 0.14*	2.02 ± 0.15*	2.883	0.005
Daytime dysfunction	Before management	2.30 ± 0.24	2.25 ± 0.25	0.854	0.396
	After management	1.75 ± 0.12*	1.84 ± 0.15*	2.772	0.007
Total score	Before management	18.24 ± 2.10	18.35 ± 2.05	0.222	0.825
	After management	12.72 ± 1.18*	13.50 ± 1.25*	2.684	0.009

Note: PSQI, Pittsburgh Sleep Quality Index.

*Indicates a significant difference compared to the value before treatment ($p < 0.05$).

Table 5. Comparison of SF-36 scores between the two groups before and after management ($\bar{x} \pm s$, points).

Indicators	Time	The MBSR group (n = 35)	The conventional group (n = 35)	*t*	*p*
Physical functioning	Before management	60.90 ± 6.52	60.80 ± 6.72	0.063	0.950
	After management	75.02 ± 7.66*	69.90 ± 7.50*	2.826	0.006
Social function	Before management	61.28 ± 6.30	61.50 ± 6.52	0.144	0.886
	After management	75.86 ± 7.45*	71.76 ± 6.52*	2.450	0.017
Role-physical	Before management	62.32 ± 6.44	62.75 ± 6.76	0.272	0.786
	After management	76.40 ± 7.30*	72.25 ± 7.18*	2.398	0.019
Mental health	Before management	68.56 ± 6.80	69.14 ± 6.74	0.358	0.721
	After management	77.90 ± 7.50*	73.30 ± 7.22*	2.614	0.011
Bodily pain	Before management	62.26 ± 5.50	61.90 ± 5.86	0.265	0.792
	After management	72.54 ± 6.20*	68.40 ± 6.38*	2.753	0.008
Role-emotional	Before management	63.35 ± 5.74	63.58 ± 5.80	0.167	0.868
	After management	73.95 ± 6.32*	69.76 ± 6.14*	2.813	0.006
Validity	Before management	61.32 ± 5.26	61.60 ± 5.38	0.220	0.826
	After management	74.50 ± 6.70*	69.90 ± 6.62*	2.889	0.005
General health	Before management	61.82 ± 5.76	61.90 ± 5.80	0.058	0.954
	After management	73.24 ± 6.95*	68.86 ± 6.50*	2.723	0.008

Note: SF-36, 36-item Short Form Health Survey.

*Indicates a significant difference compared to the value before treatment ($p < 0.05$).

Discussion

CKD is a chronic disease in which the kidney structure and function are gradually damaged. It has multiple causes and can be divided into five stages based on the glomerular filtration rate. In the early stage, most patients have no significant symptoms, and a series of symptoms and complications such as fatigue, edema, decreased urine volume, anemia, hypertension and osteoporosis can occur along with the progression of the disease [14–16]. However, relevant studies have found [17–19] that some patients with CKD suffer from poor mental state due to factors such as illness and high economic burden, and some patients' illness may be complicated with depression, which will affect their compliance and aggravate clinical complications. Therefore, it is necessary to take reasonable and scientific management measures for patients with mild-to-moderate depression who suffer from CKD.

The results of this study showed that the SDS score of the MBSR group was lower than that of the conventional group after management ($p < 0.05$), suggesting that MBSR can reduce the depression of CKD patients with mild-to-moderate depression. Liu H *et al.*'s study [20] found that music therapy combined with mindfulness-based stress reduction can reduce the pain and other physical discomfort of patients with osteosarcoma, and then improve their psychological state. The study by Song Y *et al.* [21], found that MBSR was effective in reducing measures of depression, anxiety and stress, and increasing awareness of mindfulness among nursing students in Korea. Therefore, MBSR may alleviate depression in CKD patients with mild-to-moderate depression through the above mechanisms.

The FFMQ score of the MBSR group was higher than that of the conventional group after management ($p < 0.05$), suggesting that MBSR can improve the mindfulness level of CKD patients with mild-to-moderate depression. Zhu P *et al.* [22] found that MBSR can improve patients' post-traumatic growth and perception of social support, which helps optimize positive psychological processes. The study of Jones SMW *et al.* [23] found that mindfulness therapy can relieve individual stress and improve self-efficacy level. Therefore, the above mechanisms may explain how MBSR improves mindfulness in CKD patients with mild-to-moderate depression.

The scores of all dimensions and total score of CD-RISC in the MBSR group were higher than those in the conventional group ($p < 0.05$), suggesting that MBSR can improve the resilience level of CKD patients with mild-to-moderate depression. Kral TRA *et al.* [24] found that mindfulness meditation training may improve affective responses by reducing amygdala reactivity, and the enhanced amygdala-ventromedial prefrontal cortex connectivity during affective stimuli may reflect the underlying mechanism for the beneficial effects of this treatment on emotional regulation capacity. The study by Skovbjerg S *et al.* [25] found that teaching mindfulness meditation techniques to pregnant women from socially and psychologically disadvantaged groups reduced stress and improved mental health.

Therefore, the above effects may be the main mechanisms by which MBSR therapy improves the mental resilience of CKD patients with mild-to-moderate depression.

The PSQI score of the MBSR group was lower than that of the conventional group ($p < 0.05$), suggesting that MBSR can improve the sleep quality of CKD patients with mild-to-moderate depression. MBSR therapy can have an impact on grey matter, particularly the left prefrontal cortex, which is associated with our positive emotions. Mindfulness training increases the density of cortical neurons in this region, making the human body experience more positive emotions. The increase in positive emotions is associated with a decrease in negative emotions, which can alleviate the adverse effects of negative emotions on sleep and improve sleep quality [26–30].

After management, the SF-36 scores and total scores of the MBSR group were higher than those of the conventional group ($p < 0.05$), suggesting that MBSR can improve the QOL of CKD patients with mild-to-moderate depression. The study by Janusek LW *et al*. [31] found that MBSR therapy used in cancer patients could not only provide psychological benefits, but also optimize immune function. Babak A *et al*. [32] found that mindfulness meditation therapy can stabilize the condition of patients with hypertension, improve their mental health, and then improve their QOL. Therefore, MBSR therapy may improve the QOL of CKD patients with mild-to-moderate depression through the above mechanisms.

There are some limitations to this study. Firstly, the sample is from a specific single institution and the sample size is small, which may lead to selectivity bias and limit the extrapolation of research results. Secondly, due to the retrospective cohort study design, potential confounding factors may not have been fully controlled, but this study has collected indicators that may influence the conclusion and it shows that the two groups are comparable. However, given the study design and limitations, randomized controlled trials and longer-term follow-up studies in the future are still warranted to evaluate in depth the efficacy and stability of MBSR in this specific population.

Conclusion

Despite some limitations in the study, preliminary results suggest that MBSR therapy may have a positive impact on mental health, sleep quality, and QOL in patients with CKD complicated with mild-to-moderate depression, which provides a potentially beneficial psychological intervention option for these patients.

Availability of Data and Materials

Data to support the findings of this study are available on reasonable request from the corresponding author.

Author Contributions

XL, WG and DR designed the research study. FL, HG and YM performed the research. XL and JY provided help and advice on the ELISA experiments. DR analyzed the data. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study was approved by the ethics committee of Jiading District Central Hospital Affiliated Shanghai University of Medicine & Health Sciences (approval no. 2022-029), and the data of this study were obtained through the hospital's case system and nursing records, without the informed consent of patients.

Acknowledgment

Not applicable.

Funding

This research was funded by In hospital project of Jiading District Central Hospital Affiliated Shanghai University of Medicine & Health Sciences (The Impact of Case Management Combined with Mindfulness Decompression Therapy on the Osychological Status And Quality of Life of Peritoneal Dialysis Patients), Grant No. ZQN202110.

Conflict of Interest

The authors declare no conflict of interest.

References

[1] Cockwell P, Fisher LA. The global burden of chronic kidney disease. Lancet (London, England). 2020; 395: 662–664.

[2] Zhang L, Wang F, Wang L, Wang W, Liu B, Liu J, *et al*. Prevalence of chronic kidney disease in China: a cross-sectional survey. Lancet

(London, England). 2012; 379: 815–822.

[3] Blazer DG. Epidemiology of depression: prevalence and incidence. Principles and Practice of Geriatric Psychiatry. 2002; 389–392.

[4] Aggarwal HK, Jain D, Dabas G, Yadav RK. Prevalence of Depression, Anxiety and Insomnia in Chronic Kidney Disease Patients and their Co-Relation with the Demographic Variables. Prilozi (Makedonska Akademija Na Naukite i Umetnostite. Oddelenie Za Medicinski Nauki). 2017; 38: 35–44.

[5] D'Oro A, Patel DH, Wass S, Dolber T, Nasir K, Dobre M, *et al*. Depression and incident cardiovascular disease among patients with chronic kidney disease. International Journal of Cardiology. Cardiovascular Risk and Prevention. 2023; 18: 200199.

[6] Braden BB, Pagni BA, Monahan L, Walsh MJM, Dixon MV, Delaney S, *et al*. Quality of life in adults with autism spectrum disorder: influence of age, sex, and a controlled, randomized mindfulness-based stress reduction pilot intervention. Quality of Life Research: an International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation. 2022; 31: 1427–1440.

[7] Kharaman N, Taghvaei D, Jahangiri M. Mindfulness-Based Cognitive Therapy for Depression Symptoms in Patients with Persistent Depression Disorder. Iranian Evolutionary and Educational Psychology Journal. 2022; 4: 138–145.

[8] Weir VA, Methven S. A practical guide to diagnosis and assessment of chronic kidney disease for the non-nephrologist. The Journal of the Royal College of Physicians of Edinburgh. 2020; 50: 67–74.

[9] Sepehry AA. Self-rating depression scale (SDS). Encyclopedia of quality of life and well-being research (pp. 1–9). Springer: Cham. 2021.

[10] Ni MY, Li TK, Yu NX, Pang H, Chan BHY, Leung GM, *et al*. Normative data and psychometric properties of the Connor-Davidson Resilience Scale (CD-RISC) and the abbreviated version (CD-RISC2) among the general population in Hong Kong. Quality of Life Research: an International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation. 2016; 25: 111–116.

[11] Carpenter JK, Conroy K, Gomez AF, Curren LC, Hofmann SG. The relationship between trait mindfulness and affective symptoms:a meta analysis of the five facet mindfulness questionnaire (FFMQ). Clinical Psychology Review. 2019; 74: 101785.

[12] Liu D, Kahathuduwa C, Vazsonyi AT. The Pittsburgh Sleep Quality Index (PSQI): Psychometric and clinical risk score applications among college students. Psychological Assessment. 2021; 33: 816–826.

[13] Fallahzadeh H, Balanian S, Sharifabad MAM. Evaluation of Sf-36 questionnaire dimensions in quality of life of postmenopausal women referring to Yazd city health centers in 2019. The Journal of Tolooebehdasht. 2021; 19.

[14] Djokovic A, Cooper-Thomas HD, Gardner D. Expectations and experiences of practising veterinarians throughout an 8-week mindfulness-based stress reduction programme. New Zealand Veterinary Journal. 2022; 70: 304–312.

[15] Kogon AJ, Kim JY, Laney N, Radcliffe J, Hooper SR, Furth SL, *et al*. Depression and neurocognitive dysfunction in pediatric and young adult chronic kidney disease. Pediatric Nephrology (Berlin, Germany). 2019; 34: 1575–1582.

[16] Vadiei N, Bhattacharjee S. Patterns and predictors of depression treatment among adults with chronic kidney disease and depression in ambulatory care settings in the United States. International Urology and Nephrology. 2019; 51: 303–309.

[17] Runner TR, Berryman JJ, Lehrer JC. Utility of the Beck Depression Inventory in Patients with Chronic Kidney Disease Stage 4 without Kidney Replacement Therapy. Nephrology Nursing Journal: Journal of the American Nephrology Nurses' Association. 2021; 48: 147–167.

[18] Han Y, Song X, Liu Y, Zhang W, Li J, Tu Y, *et al*. The effects of depression and age on sleep disturbances in patients with non-dialysis stage 3–5 chronic kidney disease: A single-center study. International Urology and Nephrology. 2020; 52: 739–748.

[19] Buoli M, Caldiroli L, Guenzani D, Carnevali GS, Cesari M, Turolo S, *et al*. Associations Between Cholesterol and Fatty Acid Profile on the Severity of Depression in Older Persons With Nondialysis Chronic Kidney Disease. Journal of Renal Nutrition: the Official Journal of the Council on Renal Nutrition of the National Kidney Foundation. 2021; 31: 537–540.

[20] Liu H, Gao X, Hou Y. Effects of mindfulness-based stress reduction combined with music therapy on pain, anxiety, and sleep quality in patients with osteosarcoma. Revista Brasileira De Psiquiatria (Sao Paulo, Brazil: 1999). 2019; 41: 540–545.

[21] Song Y, Lindquist R. Effects of mindfulness-based stress reduction on depression, anxiety, stress and mindfulness in Korean nursing students. Nurse Education Today. 2015; 35: 86–90.

[22] Zhu P, Wu Q, Liu X, Chen C, Ji Q, Shang X. Effects of Mindfulness-Based Stress Reduction Therapy on Posttraumatic Growth and Quality of Life in Patients With Breast Cancer Under Early Chemotherapy: A Randomized Controlled Trial. Holistic Nursing Practice. 2022. (Online ahead of print)

[23] Jones SMW, Sherman KJ, Bermet Z, Palazzo LG, Lewis CC. An experimental study to inform adoption of mindfulness-based stress reduction in chronic low back pain. Implementation Science Communications. 2022; 3: 87.

[24] Kral TRA, Schuyler BS, Mumford JA, Rosenkranz MA, Lutz A, Davidson RJ. Impact of short- and long-term mindfulness meditation training on amygdala reactivity to emotional stimuli. NeuroImage. 2018; 181: 301–313.

[25] Skovbjerg S, Birk D, Bruggisser S, Wolf ALA, Fjorback L. Mindfulness-based stress reduction adapted to pregnant women with psychosocial vulnerabilities-a protocol for a randomized feasibility study in a Danish hospital-based outpatient setting. Pilot and Feasibility Studies. 2021; 7: 118.

[26] Darehzereshki S, Dehghani F, Enjezab B. Mindfulness-based stress reduction group training improves of sleep quality in postmenopausal women. BMC Psychiatry. 2022; 22: 254.

[27] Voorend CGN, van Oevelen M, Nieberg M, Meuleman Y, Franssen CFM, Joosten H, *et al*. Impact of the COVID-19 pandemic on symptoms of anxiety and depression and health-related quality of life in older patients with chronic kidney disease. BMC Geriatrics. 2021; 21: 650.

[28] Ng QX, Yeo WS, Chong JWX, Chua Z, Yong CSK. How do we manage bipolar depression in patients with end-stage kidney disease? Asia-Pacific Psychiatry: Official Journal of the Pacific Rim College of Psychiatrists. 2021; 13: e12418.

[29] Jagielski CH, Tucker DC, Dalton SO, Mrug S, Würtzen H, Johansen C. Personality as a predictor of well-being in a randomized trial of a mindfulness-based stress reduction of Danish women with breast

cancer. Journal of Psychosocial Oncology. 2020; 38: 4–19.

[30] Choe EY, Jorgensen A, Sheffield D. Does a natural environment enhance the effectiveness of Mindfulness-Based Stress Reduction (MBSR)? Examining the mental health and wellbeing, and nature connectedness benefits. Landscape and Urban Planning. 2020; 202: 103886.

[31] Witek Janusek L, Tell D, Mathews HL. Mindfulness based stress reduction provides psychological benefit and restores immune function of women newly diagnosed with breast cancer: A randomized trial with active control. Brain, Behavior, and Immunity. 2019; 80: 358–373.

[32] Babak A, Motamedi N, Mousavi SZ, Ghasemi Darestani N. Effects of Mindfulness-Based Stress Reduction on Blood Pressure, Mental Health, and Quality of Life in Hypertensive Adult Women: A Randomized Clinical Trial Study. The Journal of Tehran Heart Center. 2022; 17: 127–133.