Efficacy of exercises in improving the quality of life for chronic kidney disease patients without dialysis

Deng-Yan Ma[1], Chong-Cheng Chen[1], Yong-Shu Diao[1], Kun Yang[2], Yi Li[3], Steve Salerno[3], Ping Fu[1]

[1]Department of Nephrology/West China School of Nursing, West China Hospital, Sichuan University, Chengdu, Sichuan 610041, China;
[2]Department of Gastrointestinal Surgery, West China Hospital, Sichuan University, Chengdu, Sichuan 610041, China;
[3]Department of Biostatistics, University of Michigan, Ann Arbor, MI 48109, USA.

To the Editor: Chronic kidney disease (CKD) is rapidly becoming a major public disease burden, affecting approximately 11% to 13% of the general population.[1] Its related treatments severely influence the physical, psychological, and social well-being of patients by restricting their daily activity. It has been shown that exercise may have multiple benefits for patients with CKD in terms of improving their physical activity, enhancing cardio-respiratory function, and promoting quality of life (QoL).[2] Furthermore, some results regarding the effectiveness of exercise on QoL in patients with CKD were inconsistent. Several studies have demonstrated that exercise significantly improved QoL in patients with CKD, while others failed to detect a significant difference despite showing evidence that post-exercise QoL scores for pre-dialysis patients with CKD were greater than at baseline. Even in studies that had indicated the effectiveness of exercise on QoL, the components of improvement varied. Thus, a meta-analysis was performed to evaluate the effect of exercise on QoL in pre-dialysis patients with CKD.

This study was performed according to the recommendations from the preferred reporting items for systematic reviews and meta-analyses protocols statement. We conducted a search in PubMed, CINAHL, and the CENTRAL databases through April 2020 and the language of the publications was restricted to English. The search terms were as follows: ("chronic kidney disease" OR "CKD" OR "renal failure" OR "renal insufficiency" OR "end stage renal disease" OR "ESRD") and ("movement" OR "sports" OR "campaign" OR "motion" OR "training" OR "train") AND ("QoL" OR "quality of life" OR "life quality"). Only randomized controlled trials that compared the efficacy of exercise in improving the QoL for patients with CKD were eligible. Studies with patients who received renal replacement treatment and the studies from which data cannot be extracted were excluded. The selection of the studies, assessment, and data extraction were completed by two independent researchers. Any discrepancies were discussed and resolved by a third researcher. The title and abstract of articles were read during the first screening. And during the second evaluation, the full texts of these studies were obtained and further assessed. Relevant data were extracted, including the first author, publication year, study design, patient enrollment, details of the intervention, sample size, outcomes, etc. And the quality of the included literature was assessed based on the migration risk of the Cochrane collaboration. QoL in patients was evaluated 12 weeks after the beginning of each intervention and applied as the outcome measurement in this meta-analysis. The composite QoL score includes measures of symptoms, effect of kidney disease, burden of kidney disease, work status, cognitive function, quality of social interaction, sleep, social support, role-physical, pain, general health perception, emotional well-being, role-emotional, social function, energy/fatigue, overall health, a physical component summary, and a mental component summary. Analysis was performed with RevMan 5.3 software (Cochrane community, London, UK). The mean difference was used as the combined statistic for the numerical outcome index of QoL. A P value less than 0.10 was considered as statistically significant for heterogeneities. A random-effects model was applied if heterogeneities existed, and a subgroup analysis was performed stratified by the time points of data collection in different studies.

A total of 921 studies were identified in our initial search. Based on the first screening, 32 studies were selected. Then, 25 studies were further excluded in the second selection process after reading the full texts. Finally, seven randomized controlled trial studies were selected. QoL was reported in seven studies via questionnaire, with three studies utilizing the SF-36 questionnaire, two studies utilizing the Kidney Disease Quality of Life questionnaire

Access this article online

Quick Response Code:

Website: www.cmj.org

DOI: 10.1097/CM9.0000000000000941

Correspondence to: Prof. Kun Yang, Department of Gastrointestinal Surgery, West China Hospital, Sichuan University, Chengdu, Sichuan 610041, China
E-Mail: yangkun068@163.com

Chinese Medical Journal 2020;133(14)

Received: 22-04-2020 **Edited by:** Yuan-Yuan Ji and Qiang Shi

Table 1: Outcomes of meta-analysis of life quality.

Items	Number of studies	Intervention group, (*n*)	Control group, (*n*)	Weighted mean difference (95% CI)	*P* value for effect size	I^2 (%)	*P* value for heterogeneity	Effect model
Symptom	2	61	62	2.05 (−0.13, 4.23)	0.07	0	0.92	Fixed
Effect of kidney disease	2	61	62	3.58 (0.78, 6.38)	0.01	0	0.88	Fixed
Burden of kidney disease	2	61	62	12.91 (7.25, 18.57)	<0.01	0	0.34	Fixed
Work status	1	16	17	6.66 (−2.67, 12.99)	0.16	NA	NA	Fixed
Cognitive function	1	16	17	7.03 (1.01, 13.05)	0.02	NA	NA	Fixed
Quality of social interaction	1	16	17	7.61 (−1.56, 16.78)	0.10	NA	NA	Fixed
Sleep	1	16	17	8.60 (2.45, 14.75)	<0.01	NA	NA	Fixed
Social support	1	16	17	4.44 (−8.21, 17.09)	0.49	NA	NA	Fixed
Overall health	2	41	42	14.64 (−6.48, 35.76)	0.17	92	<0.01	Random
Role-physical	4	110	96	19.42 (9.93, 28.90)	<0.01	6	0.36	Fixed
Pain	4	110	96	12.11 (6.73, 17.49)	<0.01	42	0.16	Fixed
General health perception	6	185	181	13.84 (6.61, 21.08)	<0.01	89	<0.01	Random
Emotional wellbeing	4	110	96	3.93 (−0.02, 7.89)	0.05	0	0.67	Fixed
Role-emotional	4	110	96	2.98 (−5.88, 11.84)	0.51	10	0.34	Fixed
Social function	4	110	96	3.40 (−1.48, 8.28)	0.17	0	0.72	Fixed
Energy/fatigue	4	110	96	9.96 (5.36, 14.55)	<0.01	0	0.95	Fixed
Physical component summary	3	80	80	11.39 (−5.79, 28.57)	0.19	96	<0.01	Random
Mental component summary	3	80	80	13.81 (−5.86, 33.48)	0.17	97	<0.01	Random

CI: Confidence interval; NA: Not applicable.

(KDQOL-SF), one study utilizing the RAND 36-item Health Survey (RAND-36), and one study utilizing the Kidney Disease Quality of Life-36 Questionnaire (KDQOL-36). A total of 393 patients were included in the pooled analysis. The characteristics and quality assessments of the included trials were listed in Supplementary Tables 1 to 3, http://links.lww.com/CM9/A253. The result shows that exercise is associated with improved QoL in terms of its effect on kidney disease, burden of kidney disease, cognitive function, sleep, role-physical, pain, general health perception, and energy/fatigue [Table 1]. And when the data were collected 12 to 16 weeks after the beginning of intervention, the same results of pooled analyses were observed as compared to the primary analyses. Only studies with a total quality assessment score of more than 10 were included in a sensitivity analysis, and the result was consistent with the primary analysis. And the symmetric funnel plot showed that there was a relatively low risk of potential publication bias in the present meta-analysis [Supplementary Figure 1, http://links.lww.com/CM9/A253]. Briefly, our results showed that exercise was associated with improved QoL in terms of its effect on the burden of kidney disease, cognitive function, sleep, role-physical, pain, general health perception, and energy/fatigue. These improvements should be interactive. Firstly, appropriate exercise was effective in improving physical capabilities and alleviating symptoms including fatigue. More efficient energy production by aerobic mechanisms also facilitates decreased muscle fatigue and increased tolerance for everyday activities.[2] Secondly, exercise may improve QoL by improving sleep quality, which accounts for positive changes in QoL. Finally, cardiovascular complications or other co-morbidities caused by CKD can be reduced with exercise,[3] while exercise may relieve the psychological anxiety caused by kidney disease or perceptions of disease burden, making them more energetic in their daily lives.[4]

While our results found no significant differences in terms of work status, social support, or role-emotional between the exercise group and the control group. This may be because some items of QoL could not be improved through exercise alone. Further, QoL could be affected by many other factors, such as CKD-associated complications and comorbidities.[5] And limited sample sizes and heterogeneities among the included studies may partly account for failure to detect significant differences in these components. Heterogeneity and controversial results among the included studies possibly due to differences in exercise protocols, patient selection, methodological limitations, and the questionnaires adopted to evaluate QoL. Therefore, the results of this meta-analysis should be interpreted and generalized cautiously.

Funding

This work was supported by grants from the Young Scientific and Academic Leaders Training Program of Sichuan University (No. 0082604151001/035); Clinical Research Incubation Project of West China Hospital of Sichuan University (No. 2018HXFH055); West China Nursing Discipline Development Special Fund Project, Sichuan University (No. HXHL19015); and Projects from Scientific and Technological Department of Sichuan Province, China (No. 2019YFS0289).

Conflicts of interest

None.

References

1. Yang C, Wang H, Zhao X, Matsushita K, Coresh J, Zhang L, *et al*. CKD in China: evolving spectrum and public health implications. Am J Kidney Dis 2019;S0272-6386:30856-X. doi: 10.1053/j.ajkd.2019.05.032.

2. Chen PY, Huang YC, Kao YH, Chen JY. Effects of an exercise program on blood biochemical values and exercise stage of chronic kidney disease patients. J Nurs Res 2010;18:98–107. doi: 10.1097/JNR.0b013e3181dda726.
3. Sarmento LA, Pinto JS, da Silva AP, Cabral CM, Chiavegato LD. Effect of conventional physical therapy and Pilates in functionality, respiratory muscle strength and ability to exercise in hospitalized chronic renal patients: a randomized controlled trial. Clin Rehabil 2017;31:508–520. doi: 10.1177/0269215516648752.
4. Tang Q, Yang B, Fan F, Li P, Yang L, Guo Y. Effects of individualized exercise program on physical function, psychological dimensions, and health-related quality of life in patients with chronic kidney disease: a randomized controlled trial in China. Int J Nurs Pract 2017;23:10.1111/ijn.12519. doi: 10.1111/ijn.12519.
5. Chow SK, Wong FK. Health-related quality of life in patients undergoing peritoneal dialysis: effects of a nurse-led case management programme. J Adv Nurs 2010;66:1780–1792. doi: 10.1111/j.1365-2648.2010.05324.x.

How to cite this article: Ma DY, Chen CC, Diao YS, Yang K, Li Y, Salerno S, Fu P. Efficacy of exercises in improving the quality of life for chronic kidney disease patients without dialysis. Chin Med J 2020;133:1738–1740. doi: 10.1097/CM9.0000000000000941