Hemodialysis and peritoneal dialysis—health-related quality of life: systematic review plus meta-analysis

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ABSTRACT

Background Patients with end-stage renal disease undergoing haemodialysis experience a variety of stressors leading to decreased level of quality of life (QoL). Thus, in this study, we aimed to review the current literature and identify factors affecting the health-related QoL (HRQoL) in these patients.

Methods A total of 147 studies were extracted from databases of Web of Science, PubMed, Scopus, Google Scholar, and Embase published between January 2000 and December 2020. Data were analysed using R software and results were reported with reference to Preferred Reporting Items for Systematic Reviews and Meta-Analyses standards.

Results A total of 623 728 patients undergoing dialysis participated in 147 studies in which QoL was assessed by means of two valid questionnaires, including Short-Form 36 (SF-36) and Kidney Disease Quality of Life (KDQOL)-short form V.1.3. Total HRQoL score for patients undergoing dialysis measured by KDQOL was 64.25 (95% CI 55.67 to 72.82). Based on SF-36, the mean score of mental health items was higher than the mean score of physical health condition. Furthermore, meta-regression based on the geographical place of residence revealed that the highest QoL in patients was observed in Japan, 66.96 (95% CI 63.65 to 70.28) and Brazil, 58.03 (95% CI 53.45 to 62.6).

Conclusion Studies conducted on HRQoL among patients undergoing dialysis recommend useful strategies to clinicians, letting them assess patients' QoL in terms of a wide range of physical, mental and environmental aspects.

Key messages

What was already known?

⇒ Statistics revealed that an estimated 2.5–7 million patients with renal failure died in 2010. Moreover, approximately 1.7 million people with acute kidney injury die each year leading to over 7 million deaths from kidney disease annually.

What are the new findings?

⇒ Total health-related quality of life (HRQoL) score for patients undergoing dialysis measured by Kidney Disease Quality of Life was 64.25 (95% CI 55.67 to 72.82). Based on Short-Form 36, the mean score of mental health items was higher than the mean score of physical health condition.

What is their significance?

⇒ Studies conducted on HRQoL among patients undergoing dialysis recommend useful strategies to clinicians, letting them assess patients' quality of life in terms of a wide range of physical, mental and environmental aspects.

INTRODUCTION

Kidney failure as the end stage of chronic kidney disease (CKD) is a serious health problem in which the kidneys can no longer work normally. Due to an increasing prevalence rate of type 2 diabetes, high blood pressure and obesity, it is expected that by the year 2030, there will remarkably be an increase in people at risk of this deadly disease all over the world.[1–3] Furthermore, 11% of the population worldwide is affected by the disease which haemodialysis (HD) and peritoneal

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dialysis (PD) have been considered as alternatives to their kidney function for survival.[4]

The Global Burden of Disease Study estimated that 1.2 million people died in 2015 from kidney failure, depicting 32% increase since 2005. Statistics also revealed that an estimated 2.5–7 million patients with renal failure died in 2010. Moreover, approximately 1.7 million people with acute kidney injury die each year leading to over 7 million deaths from kidney disease annually.[5 6] On the other hand, global health estimates revealed that the disability-adjusted life years attributed to kidney disease increased by 70% from 1990 to 2013.[7] In fact, patients with end-stage renal disease (ESRD) undergoing HD experience a variety of stressors including drug side effects, dietary restrictions, functional limitations, changes in sexual function, psychological problems due to nearing death awareness, and social/family issues; all of which affect patient's quality of life (QoL) and in some cases lead to depression and anxiety.[8–10] Literature also affirmed that these patients have a lower QoL compared with those with other chronic diseases such as cancer, heart disease, osteoarthritis, etc, and in some cases it has been reported that 30% of patients with ESRD suffered from depression.[11] This group of patients experiences a wide range of disorders including exhaustion, loss of appetite, and some more physical problems such as weak bones, sleep disorder, Willis-Ekbom disease and joint problems. Due to these difficulties, their physical, psychological and social aspects of life are adversely affected leading to decreased level of QoL.[10]

Health-related QoL (HRQoL) is a more wide-ranging concept which encompasses multidomains related to physical, psychological, emotional and social functioning.[12 13] Assessment of this measure can play an important role in setting goals for therapy, evaluating patient's needs, monitoring disease progression and therapy efficacy, and improving patient's care safely and with quality. It can also inform clinicians of the impacts of chronic diseases and other functional disabilities besides evaluating the effects of treatment interventions such as anaemia correction or changes in dialysis treatment time or dialysis frequency.[14]

Results of a study conducted in China revealed that patients who underwent dialysis for 2 years had a QoL score of 107.5. Related findings also added that factors such as age, gender, occupation and educational level were among the determinants of patients' mental well-being. In addition, residual urine volume and diabetic nephropathy were mentioned as other key factors in the QoL and physical strength of the patients.[15] Another study measured the QoL among patients with ESRD from both physical and psychological dimensions and concluded that in both aspects, indicators such as high haemoglobin level, young age, male gender, marriage, lower dialysis duration and higher education had influencing effects on increasing the QoL score.[16]

Given the role of QoL in the mental and physical health of dialysis patients, and since no integrated study has been conducted globally to assess the HRQoL in patients with ESRD with reference to their physical, psychological and social dimensions, we aimed to review the current literature and identify factors affecting the QoL in these patients.

MATERIALS AND METHODS

Registration and reporting

This systematic review was conducted based on a registered protocol at PROSPERO 2021 (CRD42021224560; available at: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42021224560) and was reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses.[17]

Databases and search terms

To meet the study objectives, the electronic databases of Web of Science, PubMed, Scopus, Google Scholar and Embase were searched to find the relevant articles via medical subject headings and specific keywords. The words used during the search were "life quality", "quality of life", "health-related quality of life", "HRQoL", "dialysis, "renal dialyses", "chronic renal failure", "hemodialysis", "peritoneal dialysis", "extracorporeal dialysis", "hemodial*, and "dial*". This systematic review focused on original articles published in English from 2000 to December 2020.

Study selection

Following the electronic search, a total number of 1986 articles were identified and entered into EndNote software to remove the duplicates. Then, the title/abstracts of 1216 remaining papers were screened by two research members independently to check the relevancy of data. We included the studies that used Short-Form 36 (SF-36) or KDQOL (Kidney Disease Quality of Life) questionnaire to determine the QoL score among patients with ESRD. Studies which incorporated quantitative data on determinants of QoL such as sociodemographic factors and disease duration were also included in the review. Therefore, a total number of 367 relevant articles were independently analysed in order to determine their eligibility. Finally, after applying inclusion/exclusion criteria, 147 studies were selected (figure 1).

Inclusion criteria

Studies with observational designs of cross-sectional, cohort, case study, case series, descriptive and prospective which reported QoL in patients undergoing dialysis based on SF-36 or KDQOL were included if they were published in English between January 2000 and December 2020.

Exclusion criteria

Articles in languages other than English, published before January 2000, with designs of review, letter

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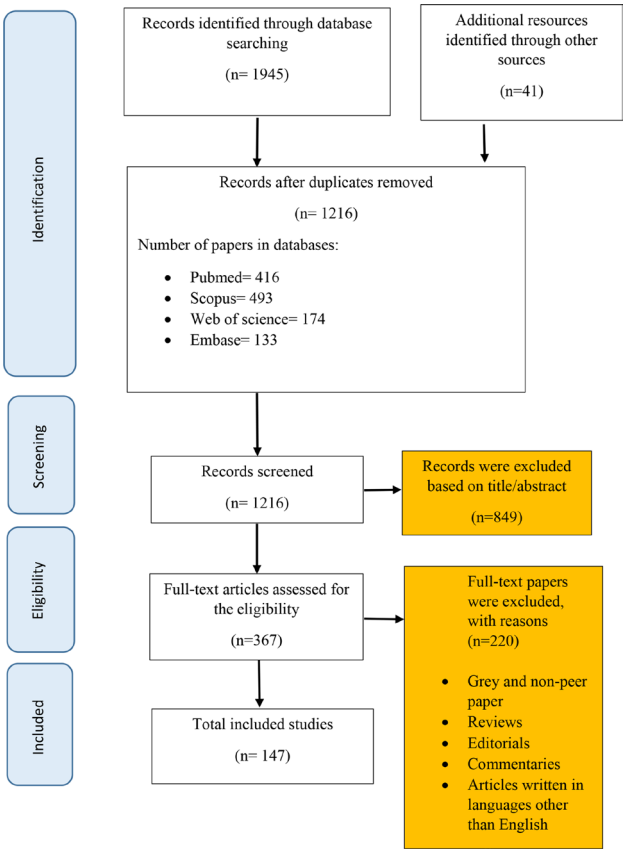


Figure 1 Flow diagram of our review process (Preferred Reporting Items for Systematic Reviews and Meta-Analyses).

to editor, editorials, commentaries, expert opinions, case–control, randomised controlled trials, brief reports, book chapters and thesis were excluded from the review. In addition, studies addressing treatment effects, medication, and clinical decision-making or those reporting invalid figures or tables were not included in the research.

Data collection tool

Short-Form 36

SF-36 consists of physical and mental component scores ranging from 0 (the worst health status) to 100 (the best health condition).

Kidney Disease Quality of Life

The KDQOL-short form V.1.3 consists of 36 questions about the general health status from both physical and mental dimensions. It also includes 43 specific questions related to renal failure which mainly focus on some typical problems that patients with ESRD encounter including symptoms, adverse effects on daily activities, weight, sexual function, employment status, cognition, social interactions and sleep quality.[18 19]

The score of both questionnaires was between 0 and 100 divided into five categories: very poor (0–20), poor (21–40), average (41–60), good (61–80) and very good (81–100).

Quality assessment of included articles

The Newcastle–Ottawa Scale was used by two independent researchers to assess the quality of included articles in terms of dimensions of selection process (including definition and representativeness of cases, selection and definition of controls); comparability of cases and controls; ascertainment of exposure/outcome, selection of study groups and their comparability. In case of any disagreement, a third reviewer resolved the issue. Scores were displayed as 0 and 1 for unreported and reported items, respectively. The total quality score of articles was calculated through the sum of the points computed for the reported items, indicating a score of 10 as the best quality and a score of 0 as the lowest quality. The articles with the average score less than 4 were considered to be low quality.[20]

Data extraction

Two investigators extracted data through the use of a standardised data extraction sheet including items of author's name, publication date, research setting, study design, type of HRQoL questionnaire used, sample size, the score of research quality, participants' sociodemographic characteristics and a summary of study findings in terms of HRQoL scores among patients with ESRD.

Data analysis

To estimate the mean and variability of effect size across studies, a random-effects analysis (Der Simonian and Laird) was used for meta-analysis. The results were presented on forest plots at 95% CI. Publication date and sample size were selected as criteria for measuring heterogeneity test (I^2) of enrolled articles. Furthermore, subgroup analysis was done by sample size, research setting, mean age groups, body mass index (BMI), duration of dialysis and type of dialysis. To measure publication bias, Egger's test was used and data were analysed using R software.

RESULTS

Overview of meta-analysis

After extraction of data from 147 articles, the total number of patients undergoing dialysis was reported to be 623 728. Based on KDQOL and SF-36, total HRQoL scores in patients were calculated at 64.25 (95% CI 55.67 to 72.82) and 48.83 (95% CI 46.78 to 50.87), respectively (table 1).

Meta-regression based on subgroups (age, BMI, duration of dialysis)

Results affirmed a significant reverse relationship between HRQoL and age ($p<0.001$). In fact, a unit of increase in patients' age decreased their QoL by 0.09. According to the meta-regression results, QoL in dialysis patients had a significant inverse relationship with BMI ($p<0.001$), so a unit of increase in BMI decreased the QoL by 0.34. Subgroup analysis revealed that the

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Table 1 Meta-regression of quality of life based on assessment tools

	Effect size and 95% CI						Test of null (2-tail)	
Random effects	Number of studies	Point estimate	SE	Variance	Lower limit	Upper limit	Z value	P value
KDQOL	10	64.25	4.37	19.14	55.67	72.82	14.69	0.00
SF-36	78	48.83	1.04	1.09	46.78	50.87	46.78	0.00
Mix	59	49.91	0.47	0.22	48.99	50.84	105.89	0.00
Total	147	50.24	0.41	0.17	49.45	51.04	123.61	0.00

KDQOL, Kidney Disease Quality of Life; SF-36, Short-Form 36.

duration of dialysis had a significant direct relationship with QoL ($p<0.001$). Indeed, a year of increase in the duration of disease led to an increased HRQoL by 0.41 (figure 2).

Meta-regression based on country, continent and WHO region

According to the analysis, the highest QoL in patients undergoing dialysis was observed in Japan, 66.96 (95% CI 63.65 to 70.28) and Brazil, 58.03 (95% CI 53.45 to 62.6), respectively. On the other hand, the lowest QoL was observed in Iran and Egypt as depicted in table 2.

Subgroup analysis based on continents showed that South America got the highest score in terms of HRQoL, 56.37 (95% CI 52.08 to 60.65) with Africa and Europe in the second and third ranking. In addition, North America got the lowest QoL score at 48.62 (95% CI 46.85 to 50.40) (table 2). The meta-regression results based on WHO regions confirmed that the highest HRQoL score was related to African Region Organization with only one study, 65.20 (95% CI 62.69 to 67.71) followed by Pan American Health Organization with 40 studies, 52.63 (95% CI 50.97 to 54.30). The lowest QoL was reported for Eastern Mediterranean Region Organization, 46.81 (95% CI 39.47 to 54.16) (table 2).

Meta-regression by data collection tool

Results of the meta-regression by using SF-36 revealed that QoL scores in physical and mental health dimensions were 39.26 (95% CI 38.74 to 39.79) and 46.79 (95% CI 46.19 to 47.40), respectively. Furthermore, the average scores of QoL in patients undergoing PD were 42.10 (95% CI 40.27 to 43.93) and 47.94 (95% CI 46.02 to 49.86) correspondingly. On the other hand, among different items of the questionnaire, the highest score was reported for mental health while the lowest belonged to physical strength (table 3).

The total HRQoL score for patients undergoing HD measured by KDQOL was 60.52 (95% CI 57.79 to 63.26); while the score for PD patients was 59.61 (95% Cl 41.31 to 77.91). Among different items of the questionnaire, the highest score was reported for staff encouragement and the lowest was related to work status (table 4).

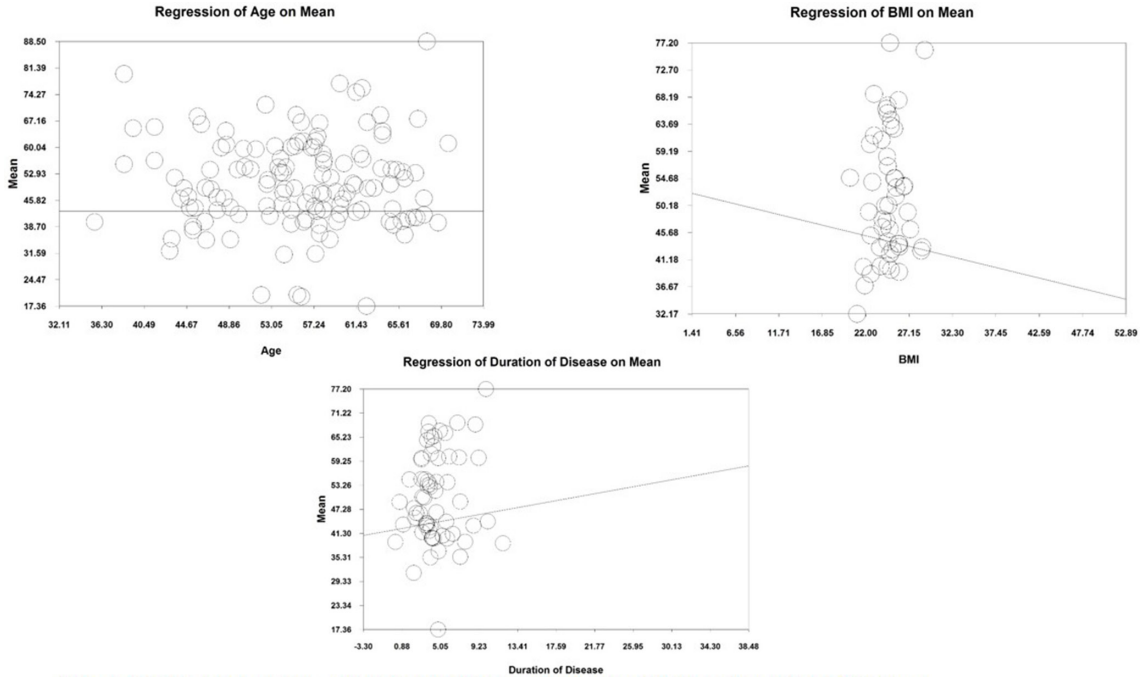


Figure 2 Meta-regression of quality of life based on age, BMI and duration of disease. BMI, body mass index.

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Table 2 Meta-regression of quality of life based on countries, continents, WHO regions

		Effect size and 95% CI						Test of null (2-tail)	
Subgroups	Mixed-effects analysis	Number of studies	Point estimate	SE	Variance	Lower limit	Upper limit	Z value	P value
Countries	Brazil	18	58.03	2.34	5.45	53.45	62.60	24.85	<0.001
	China	9	47.16	1.81	3.26	43.62	50.69	26.12	<0.001
	Egypt	4	41.82	8.66	75.01	24.84	58.79	4.83	<0.001
	Iran	9	41.88	5.42	29.41	31.25	52.51	7.72	<0.001
	Japan	4	66.96	1.69	2.86	63.65	70.28	39.61	<0.001
	The Netherlands	6	46.68	2.08	4.35	42.59	50.76	22.39	<0.001
	Spain	5	56.42	4.68	21.94	47.24	65.60	12.04	<0.001
	Turkey	15	47.67	1.37	1.89	44.98	50.36	34.69	<0.001
	USA	16	47.59	0.94	0.89	45.74	49.43	50.54	<0.001
	Multi	12	52.01	1.79	3.20	48.51	55.52	29.07	<0.001
	Other	49	51.16	1.55	2.41	48.12	54.20	32.95	<0.001
Continents	Africa	4	50.65	1.02	1.47	31.01	70.30	5.05	<0.001
	Asia	44	49.50	1.73	3.01	46.10	52.90	28.54	<0.001
	Europe	48	50.12	1.24	1.54	47.69	52.54	40.44	<0.001
	North America	18	48.62	0.91	0.82	46.85	50.40	53.65	<0.001
	South America	22	56.37	2.19	4.79	52.08	60.65	25.76	<0.001
	Multi	11	49.51	1.81	3.28	45.95	53.06	27.32	<0.001
WHO regions	AFRO	1	65.20	1.28	1.65	62.69	67.71	50.82	<0.001
	EMRO	18	46.81	3.75	14.04	39.47	54.16	12.49	<0.001
	EURO	48	50.12	1.24	1.54	47.69	52.54	40.44	<0.001
	PAHO	40	52.63	0.85	0.72	50.97	54.30	62.01	<0.001
	SEARO	7	47.95	3.28	10.76	41.52	54.38	14.62	<0.001
	WPRO	23	51.32	1.81	3.28	47.77	54.87	28.34	<0.001
	Multi	10	50.23	1.90	3.60	46.51	53.96	26.46	<0.001

Multi: the studies which were investigated on some countries in the same time.
AFRO, African Region Organization; EMRO, Eastern Mediterranean Region Organization; EURO, European Region Organization; PAHO, Pan American Health Organization; SEARO, South-East Asian Region Organization; WPRO, Western Pacific Region Organization.

Meta-regression for quality assessment tool

The results showed that more than half of the studies had high and medium quality by 60 and 64, respectively. High-quality studies presented a score of 57.32 (95% CI 52.14 to 64.37) and medium ones reported 41.67 (95% CI 36.47 to 48.74) (table 5).

DISCUSSION

To our knowledge, this study is the first worldwide systematic review and meta-analysis examining the HRQoL and the determinants across patients who underwent HD and PD. Based on our study results, the QoL score analysed by the SF-36 questionnaire was 48.83, depicting an average level in patients. HD adversely affects the lifestyle of patients and their family members resulting in dependence on caregivers' help, loss of employment, disruption of social life and adverse psychological outcomes.[21] Due to these limitations, the QoL of patients decreases dramatically from a broad range of physical, mental, emotional, social and environmental domains.[22] Several studies have affirmed that patients undergoing HD have a poor HRQoL and face with multiple complications, from impaired physical functioning to concentration problems and memory loss.[23] Similarly, Unruh *et al* reported lower HRQoL scores for patients with ESRD than healthy individuals.[24] Another study added that low HRQoL scores in these patients are associated with their medical condition and the resulting socioeconomic difficulties.[25] Accordingly, a number of researchers have suggested regular HRQoL surveillance as an integrated part of standard assessment for patients with ESRD so that therapeutic interventions will have the greatest impact.[26 27]

In a subgroup analysis, the scores of QoL in patients with ESRD were higher in South America compared with other continents. Based on our review, among different countries of this continent, the quality of life of Brazilians was at the top of the hierarchy, showing a relatively good condition in patients with severe kidney failure. This result might be due to an appropriate performance of the country health sector in using supportive strategies to protect patients especially from social and psychological destructive impacts. On the other hand, the HRQoL in North America was lower compared with other continents. Diabetic nephropathy, as one of the main causes of

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Table 3 Meta-regression of quality of life based on SF-36 items

	Model	Effect size and 95% CI				
Types of dialysis	Random effects	Point estimate	SE	Variance	Lower limit	Upper limit
Haemodialysis	Physical functioning	50.34	1.15	1.32	48.09	52.59
	Social functioning	60.88	2.51	6.32	55.95	65.80
	Role—physical	36.58	1.70	2.89	33.24	39.91
	Role—emotional	49.54	3.25	10.58	43.17	55.92
	Mental health	62.43	1.79	3.20	58.93	65.94
	Vitality	48.70	1.34	1.81	46.07	51.33
	Bodily pain	56.10	1.84	3.40	52.49	59.72
	General health	44.13	1.16	1.36	41.84	46.41
	Physical component summary	39.26	0.27	0.07	38.74	39.79
	Mental component summary	46.79	0.31	0.10	46.19	47.40
Peritoneal dialysis	Physical functioning	57.38	3.43	11.76	50.66	64.10
	Social functioning	61.21	8.20	67.27	45.13	77.29
	Role—physical	40.29	4.58	20.96	31.32	49.26
	Role—emotional	56.73	8.59	73.77	39.90	73.57
	Mental health	63.40	5.19	26.96	53.22	73.57
	Vitality	45.56	3.88	15.02	37.96	53.15
	Bodily pain	60.85	7.35	54.05	46.44	75.26
	General health	43.18	2.36	5.58	38.55	47.81
	Physical component summary	42.10	0.93	0.87	40.27	43.93
	Mental component summary	47.94	0.98	0.96	46.02	49.86

SF-36, Short-Form 36.

ESRD, was reported to be more prevalent in the USA than other countries which partly could explain the poorer physical functioning of patients in this region. Lower income level and poorer work condition in the USA might also explain some of the differences in physical functioning scores.[28]

In our study, changes in physical and mental aspects of QoL among dialysis patients were influenced by their age. In fact, functional dependencies among elderly people undergoing HD were raised in older adults and consequently led to dramatic decline in HRQoL.[29] This decline can be due to the fact that with increasing age, the patient energy, work capacity and overall physical health are deteriorating.[30] Ravindran *et al* also found a decrease in scores of mental health domain with increasing age and explained that due to receiving inadequate support from family members, lack of community support and financial difficulties, patients find themselves in a state of isolation, depression, anxiety and sadness.[30] Similarly, Lopes *et al*[31] found an inverse relationship between age and physical dimension of QoL; while they reported a direct association between age and mental health. Authors emphasised that ageing had a more damaging impact on the physical condition of patients with ESRD than on their mental health. They believed that as time passes, patients become more adaptable to functional limitations and mental disorders occurring as a result of the disease. Thus, such an adaptive power might lead to fewer psychological problems in older patients.[31] In the social domain, some of the studies revealed lower QoL scores in older patients, while some others showed better QoL in elderly patients than younger individuals.[32] Such differences might be due to different levels of supportive programmes at different communities and perhaps because of diverse tools used to assess patients' QoL.

According to our review, higher BMI was associated with reduced QoL in patients with ESRD. Similarly, a study conducted by Schweitzer *et al* mentioned obesity as one of the factors associated with decreased HRQoL and emphasised on the necessity of maintaining a healthy weight to improve QoL.[33] On the other hand, Suh *et al*[34] found that the association between obesity and HRQoL in patients with CKD was limited to the mobility dimension, so obesity considerably diminished the ability to move in these patients. They concluded that mild obesity in patients with CKD might approve a good diet without acute inflammation resulting in preserved QoL. Similar studies confirmed that obesity might not abolish HRQoL by itself in a population with CKD, rather, metabolic abnormalities and acute inflammation would be actually linked to low QoL.[34]

The duration of dialysis was another influencing factor on QoL of dialysis patients. According to a linear regression analysis, Vasilieva found that the duration of dialysis was a significant predictor for low physical health condition in HD patients.[35] A similar study conducted by Anees *et al* revealed that as the duration of dialysis increases, the QoL of dialysis patients declines dramatically.[36] Mollaoglu also reported lower scores of QoL in patients with more than 8-month

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Table 4 Meta-regression of quality of life based on Kidney Disease Scale items

	Model	Effect size and 95% CI				
Types of dialysis	Random effects	Point estimate	SE	Variance	Lower limit	Upper limit
Haemodialysis	Symptoms and problems	73.45	0.42	0.18	72.63	74.28
	Effect of kidney disease	62.92	0.91	0.83	61.13	64.71
	Burden of kidney disease	40.37	1.46	2.12	37.52	43.22
	Work status	28.55	1.34	1.80	25.93	31.18
	Cognitive function	72.60	1.67	2.80	69.32	75.88
	Quality of social interaction	72.41	1.40	1.96	69.67	75.16
	Sexual function	62.69	2.41	5.80	57.97	67.41
	Sleep	59.63	0.87	0.75	57.93	61.33
	Social support	75.92	0.83	0.69	74.30	77.55
	Dialysis staff encouragement	79.96	1.41	1.97	77.21	82.71
	Overall health	58.51	1.07	1.14	56.41	60.60
	Patient satisfaction	72.51	1.29	1.66	69.99	75.04
	Kidney disease component scale	60.52	1.39	1.94	57.79	63.26
Peritoneal dialysis	Symptoms and problems	73.16	1.67	2.80	69.88	76.43
	Effect of kidney disease	67.86	2.93	8.57	62.12	73.59
	Burden of kidney disease	43.35	3.00	9.00	37.48	49.23
	Work status	35.01	4.99	24.88	25.23	44.78
	Cognitive function	77.40	2.11	4.44	73.27	81.54
	Quality of social interaction	67.07	3.65	13.34	59.91	74.23
	Sexual function	63.24	2.11	4.47	59.10	67.38
	Sleep	60.53	2.79	7.78	55.06	66.00
	Social support	72.57	2.95	8.70	66.79	78.35
	Dialysis staff encouragement	86.96	1.93	3.74	83.17	90.75
	Overall health	64.54	7.37	54.25	50.11	78.98
	Patient satisfaction	80.64	2.03	4.13	76.66	84.63
	Kidney disease component scale	59.61	9.34	87.18	41.31	77.91

duration of HD compared with those with duration less than 8 months.[37] Literature affirmed that a longer period of HD reflected greater disease burden, and more negative effects on physical, emotional and psychological health.

Comparing QoL between patients who underwent PD and HD showed that PD patients had greater lifestyle flexibility than HD patients. In fact, as PD could typically be done at home or in a comfortable place as it imposes less restriction on patients, bringing them better QoL in terms of emotional dimension. Furthermore, PD allows patients to have a more flexible diet as it is performed more frequently, leading to reduced accumulation of sodium, potassium and fluid in body organs.[38]

CONCLUSION

Studies conducted on QoL recommend helpful strategies to clinicians, letting them assess patients' QoL in terms of a wide range of physical, mental and environmental aspects. Such information enables them to identify the real needs of patients undergoing dialysis and meet them in an appropriate way. To our knowledge, no similar study has been done to compare QoL in different continents and determine the influencing factors on various dimensions of life quality. The evaluation of QoL in dialysis patients can also provide applicable information to verify the effectiveness of clinical interventions, evaluate the mental and emotional burden of the disease, and identify the impact of a specific treatment strategy on a patient

Table 5 Meta-regression based on quality assessment tools (NOS)

Subgroups	Type of questionnaires	Number of studies	Point estimate	Lower	Upper	I^2
Quality assessment tool (NOS)	High	60	57.32	52.14	64.37	99.44%
	Medium	64	41.67	36.47	48.74	95.87%
	Low	23	49.87	43.54	59.17	98.65%

NOS, Newcastle–Ottawa Scale.

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through evaluating the quality of medical care. This study also provides evidence-based information about the effects of factors including age, BMI, duration of illness, type of dialysis and geographical area of residence on patients' QoL which can be applied to plan an efficient individual treatment strategy for patients undergoing dialysis.

Limitation

One of the most important limitations of this study was the lack of studies in some countries, leading to a lack of data in some regions; therefore, we suggest further studies in these regions in the future. Another limitation was the lack of access to some articles and the unavailability of the full text for some studies. The data collection tools selected in this study included KDQOL and SF-36 scales; some studies had insufficient data and others employed different tools.

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Correction notice This article has been updated since it was first published. The article type has been changed to Systematic review.

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