Quality of Life Research (2020) 29:81–89
https://doi.org/10.1007/s11136-019-02378-4

Hope predicted quality of life in dyads of community-dwelling patients receiving hemodialysis and their family caregivers

Sami Al-Rawashdeh[1] · **Ali Alshraifeen**[2] · **Mohammad Rababa**[3] · **Ala Ashour**[2]

Accepted: 25 November 2019 / Published online: 2 December 2019

Abstract

Purpose End-stage renal disease (ESRD) patients on hemodialysis (HD) and their family caregivers (FCGs) reported poor quality of life (QoL). Hope has shown association with QoL at the individual level. However, the association between hope and QoL in dyads has never been examined in particular in dyads of patients and FCGs. The purpose of this study was to examine the associations between hope and QoL in dyads of ESRD patients on HD and their family caregivers (FCGs).

Methods This was a cross-sectional study in which data were collected from 123 community-dwelling patient–FCG dyads. Hope was measured using the Herth Hope Index and QoL was *measured using* the World Health Organization Quality of Life *BREF*. The Actor–Partner Interdependence Model multilevel modeling dyadic analysis approach was used to analyze the data.

Results Each individual's hope scores predicted their own better QoL scores. Patients' hope scores predicted better Environmental domain QoL in FCGs.

Conclusion All domains of QoL of patients and their FCGs are related to their own level of hope. Better FCGs' environment domain of QoL was linked to high patients' levels of hope. Improving QoL may be achieved by targeting and improving hope in both members of the dyad.

Keywords Hope · Quality of life · Dyads · End-stage renal disease · Hemodialysis, family caregivers · Dyadic analysis

Introduction

End-Stage Renal Disease (ESRD) is a chronic form of chronic kidney disease that represents a global public health problem [1]. According to the statistics from the Centers for Diseases Control and Prevention (CDC), about 125,000 Americans started treatment for ESRD in 2016 and about 726,000 were already on ESRD treatment either dialysis or kidney transplant [2]. The actual number might be much larger and the prevalence rate is expected to increase [3]. Hemodialysis (HD) treatment is a common treatment modality for patients with ESRD [4, 5]. Poor quality of life (QoL) is a common complaint reported by ESRD patients receiving HD treatment [6]. ESRD patients mainly need help and support from their family caregivers (FCGs) who reported poor QoL as well [5, 7]. Although FCGs' QoL was reported to be better than ESRD patients' QoL [8], the FCGs' QoL was still lower than the level of QoL reported in general population [5, 7].

Although many factors may contribute to the QoL and the well-being of ESRD patients and their FCGs, hope is a positive concept that has shown association with better

✉ Sami Al-Rawashdeh
samiy@hu.edu.jo

Ali Alshraifeen
alshra76@hu.edu.jo

Mohammad Rababa
mjrababa@just.edu.jo

Ala Ashour
aashour76@hu.edu.jo

[1] Department of Community and Mental Health Nursing, Faculty of Nursing, The Hashemite University, P.O. Box 330127, Zarqa 13133, Jordan

[2] Department of Adult Health Nursing, Faculty of Nursing, The Hashemite University, P.O. Box 330127, Zarqa 13133, Jordan

[3] Adult Health Nursing Department, Faculty of Nursing/WHO Collaborating Center, Jordan University of Science and Technology, Irbid, Jordan

QoL in patients with ESRD [9], and in FCGs [10, 11]. Hope is defined as a multidimensional dynamic inner power in response to life events that helps individuals pass the challenges or the events safely and brings new positive awareness for them [12]. Hope is important for people to cope with suffering and stressful situations [13]. However, the concept of hope has received very little attention in previous studies.

Moreover, most of the research related to home caregiving of patients with chronic illnesses focused on either patients or FCGs at the individual level. To better inform practice and theory, it is very important to include both patients and their FCGs in the research because of the interdependence between individuals in a close relationship (individuals may influence and/or get influenced by those within their social environment) [14]. Patients and their FCGs may influence the outcomes of each other since they share the same living conditions and they may have a similar way of thinking [15]. In addition, Scanlon [16] suggests that the hopefulness of a person (such as a patient or a family member) may affect the outcome of the other member in the relationship. This interdependence can be controlled and this relationship is better examined using the Actor–Partner Interdependence Model (APIM) multilevel modeling dyadic analysis approach. The APIM allows the examination of "the actor effect" that represents one's own characteristics (hope) predicting one's own outcomes (QoL) while controlling his or her partner's independent variable (partner's hope) [17]. It also allows the examination of "the partner effect" that represents one's own characteristics (hope) predicting the outcome in the partner (partner's QoL) while controlling the partner's own independent (hope) variable [17].

To the best of our knowledge, no study has examined the associations between hope and QoL in individuals with interdependent relationships using the APIM dyadic approach. Furthermore, scholars stressed the importance of using dyadic data analysis techniques in research when dealing with patients and their FCGs [18]. Therefore, the purpose of this study was to examine whether individuals' hope scores predicted their own QoL, as well as that of their partners' in dyads of community-dwelling hemodialysis patients and their FCG using the APIM analysis approach. We predict that hope in one partner will affect his or her own QoL (actor effect) as well as the QoL of the other partner in the dyad (partner effect).

Methods

Design, setting, and sample

This was a cross-sectional study of patients receiving HD treatment in Jordan and their FCGs who were recruited from HD units in hospitals managed by the Ministry of Health (MoH), Royal Medical Services (military), and Jordan University of Science and Technology. A convenience sampling method was used. ESRD patients and their FCGs were recruited if they were able to give consent, had no terminal illness, were aged 18 years or older, and had been on HD (for patients) or had been providing home care to a patient on HD (for FCGs) for 3 or more months. Patients identified their FCGs for the purpose of this study. Data of 123 dyads of patients and their FCGs who had no missing data on the main study variables were analyzed.

Procedure

The study was approved by the Institutional Review Boards (IRB) at the Hashemite University and the participating clinical sites. A written consent to participate was obtained from both patients and their identified FCGs prior to data collection. A trained research assistant approached potential participants to screen for eligibility and to obtain their initial approvals for participation. Then, the research assistant explained the study and distributed a letter of invitation and information leaflet to patients and their FCGs. Participants who agreed to participate were asked to complete the study questionnaires and return them to the researcher or the trained research assistant at the end of the HD session or in the next HD session. All participants were assured of their rights including the rights of confidentiality and privacy of data and voluntary participation. Data were collected over a 7-month period from December 2018 to June 2019.

Measures

Demographic and background data for both patients and their FCGs were collected by a checklist developed by the researchers along with measures to collect data on hope and QoL using self-report.

Hope

Hope was measured using the Herth Hope Index (HHI). HHI is a self-report scale consisting of 12 items rated on a 4-Likert-type scale in which 1 = "strongly disagree," 2 = "disagree," 3 = "agree," and 4 = "strongly agree" [19]. The total score of the HHI was calculated by summing the responses of the 12 items with a possible score ranging between 12 and 48 with higher scores indicating higher levels of hope [19]. The HHI was developed to be used in clinical settings and has been translated into different languages [20]. The HHI reported to have an internal consistency reliability that ranged from 0.89 to 0.97 and a test–retest reliability of 0.91 for different patient populations [21, 22] and FCGs of terminally ill patients [12]. The face and content validities of the HHI were supported [19]. In addition, the construct, divergent, and concurrent criterion-related validity of the HHI was supported in a sample of 172 ill adults (70 were acutely ill, 71 were chronically ill, and 31 were terminally ill) [21] as well as convergent and discriminant validity in FCGs of patients with cognitive impairment [22]. The Cronbach's alpha of the HHI in our study was 0.81 for patients and 0.80 for FCGs.

QoL

The World Health Organization Quality of Life BREF (WHOQoL BREF) was used to measure the QoL. It is a 26-item questionnaire that measures four domains of the QoL including Physical health (7 items), Psychological health (6 items), Social Relationships (3 items), and Environmental (8 items) [23]. Item responses range between 1 and 5. The domain scores can be transformed into scores of 0–100 scale with higher scores indicating better QoL [24]. The reliability and validity of the WHOQoL BREF were supported in the general population [25] and in Arabic-speaking FCGs [26]. In our study, the Cronbach's reliability alphas for patients were 0.87, 0.84, 0.79, and 0.84 and for FCGs were 0.89, 0.80, 0.79, and 0.79 for the Physical, Psychological, Social Relationships, and Environment domains, respectively.

Data analysis

The data were analyzed using the Statistical Package for the Social Sciences software version 25 (SPSS Inc., Version 25, Chicago, IL) with the significance level set at $p < 0.05$. The participants' demographic and background data were described as mean ± standard deviation for continuous variables (i.e., age, duration of caregiving in years, number of caregiving days/week, and number of caregiving hours/day) or as frequency (number and percentage) for variables of gender, marital status, education level, monthly income, employment status, relationship to patient, and history of illnesses. Hope and QoL scores were compared between patients and FCGs using the paired sample *t* test. Pearson Product-moment correlations were used to examine the correlations between hope scores and QoL *domains* in patients and FCGs. Data were restructured into pairwise form and grand-mean centered (the predictor and the outcome variables were averaged across partners). The APIM with distinguishable (distinguished by their role as a patient or as a FCG) dyad analyses were conducted to estimate actor and partner effects for the independent variable of hope (predictor) on the outcomes of the Physical, Psychological, Social Relationships, and Environment domains of QoL (one separate analysis for each domain) using both SPSS software and the Actor–Partner Interdependence Model (APIM) using multilevel modeling (APIM_MM) app program written by David A. Kenny. Both tests showed 100% identical results. The interdependence in the APIM is accounted for by measuring the associations between scores within the dyad and measuring the extent to which each dyad member influences the other member's outcome [17, 27].

Results

Sample characteristics

The sample consisted of 123 HD patient–FCG dyads (Table 1). FCGs were younger than patients by about 10 years (39 ± 14.58 vs 48.75 ± 15.48 years). The proportion of females (52% vs 43.1%) and full- or part-time employed (38.2% vs 22.8%) in the FCGs' group was higher than in patients. The proportion of respondents with high school or lower education level (81.3% vs 66.7%) and with a history of hypertension (47.2% vs 14.6%) or diabetes (26.8% vs 8.9%) in patients was higher than in FCGs. The proportions related to marital status, monthly income, and employment status were almost similar. About one-third of FCGs were sons or daughters of the patients. A detailed description of the respondents' characteristics is presented in Table 1.

Level of hope and QoL

Although both patients and FCGs had a moderate level of hope (defined as scores of 24–35) [28], FCGs had a significantly greater level of hope scores (better) than HD patients (33.47 ± 4.06 vs 32.06 ± 3.81, $p = 0.002$, Table 2). In addition, FCGs had significantly higher scores (better) in all domains of QoL than HD patients. HD patients had scores less than 50 in all domains of QoL except for the Social Relationships domain which was 53.54 ± 22.13 (the highest). FCGs had scores higher than 50 in all domains of QoL with the highest score was for the Physical domain (63.65 ± 21.6). The lowest scores recorded in all domains of QoL were the Physical domain (46.54 ± 20.76) for HD patients and the Environment domain (52.46 ± 16.19) for FCGs.

The scores of patients on the HHI had significant, small, and positive correlation ($r = 0.247$) with the HHI scores in FCGs (results not shown). The scores of patients and FCGs on the HHI had a significant moderate positive correlation with their own scores in all QoL domains as well as with some of their partners' domains of QoL. Patients' scores in the HHI had a significant positive correlation with the FCGs' scores in all domains of QoL except for the Psychological domain. FCGs' scores in the HHI were significantly and positively correlated with patients' scores in the psychological and Social Relationships domains only.

Table 1 Characteristics of patient–FCG dyads (*N* = 123)

Characteristics	Patients (*n* = 123) Mean ± SD or *n* (%)	FCGs (*n* = 123) Mean ± SD or *n* (%)
Age, years	48.75 ± 15.48	39.06 ± 14.58
Gender, female	53 (43.1)	64 (52)
Marital status		
Married	86 (69.9)	82 (66.7)
Single	31 (25.2)	38 (30.9)
Divorced or widowed	6 (4.9)	3 (2.4)
Education, ≤ high school	100 (81.3)	82 (66.7)
Monthly income, *[a]		
< $350	76 (61.8)	85 (69.1)
$350–700	0 (0)	0 (0)
> $700	7 (5.7)	7 (5.7)
Employment, *[b]		
Employed full or part-time	28 (22.8)	47 (38.2)
Not employed	93 (75.6)	74 (60.2)
Relationship to patient, *[c]		
Parent	–	15 (12.2)
Spouse	–	32 (26)
Brother or sister	–	14 (11.4)
Son or daughter	–	44 (35.8)
Others (uncle or aunt)	–	3 (2.4)
Duration of caregiving, years	–	6.51 ± 5.75
Caregiving days/week	–	4.8 ± 2.17
Caregiving hours/day	–	9.7 ± 8.12
History of hypertension	58 (47.2)	18 (14.6)
History of diabetes	33 (26.8)	11 (8.9)
History of cardiac disease	19 (15.4)	5 (4.1)
Site of research		
Hospitals managed by MoH	47 (38.2)	–
Hospitals managed by military	58 (47.2)	–
Hospitals managed by the university	18 (14.6)	–

SD standard deviation

*Totals do not equal to 123: missing data for 40 patients ([a]), 2 patients ([b]), 31 FCGs ([a]), 2 FCGs ([b]), and 15 FCGs ([c])

Table 2 Comparisons of patient–FCG dyads on variables of hope and domains of QoL (*N* = 123)

Measure	Patients (*n* = 123)		FCGs (*n* = 123)		Paired *t* test*	*p* value
	Min–Max	Mean ± SD	Min–Max	Mean ± SD*		
Hope scores	19–42	32.06 ± 3.81	21–43	33.47 ± 4.06	− 3.24	0.002
QoL						
Physical domain	0–88	46.54 ± 20.76	6–100	63.65 ± 21.6	− 6.70	< 0.001
Psychological domain	0–94	49.68 ± 18.7	18–100	55.6 ± 17.75	− 2.98	0.003
Social relationships Domain	0–100	53.54 ± 22.13	0– 100	59.8 ± 23.36	− 2.42	0.017
Environment domain	6–81	48.56 ± 17.86	19–88	52.46 ± 16.19	− 2.08	0.04

SD Standard deviation

*df was 122

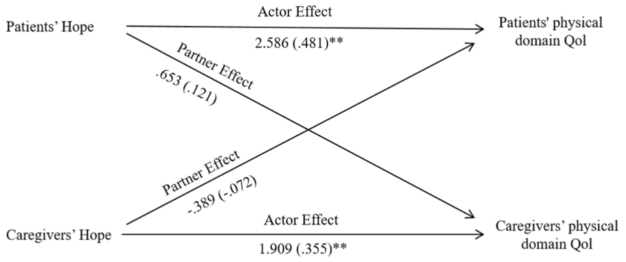

Fig. 1 The estimated actor and partner effects (and the standardized effect) of Hope scores as a predictor of the Physical domain of QoL using the Actor–Partner Interdependence Model. *p value < 0.05, ** p value < 0.001

Association between hope and QoL domains

Association between hope and the physical domain of QoL

The scores of hope in both patients and FCGs demonstrated only actor effect on the Physical domain of QoL (p values < 0.001 for both members of the dyad, Fig. 1, Table 3). The actor effect was 2.586 (the standardized effect was 0.481, medium effect size) for patients and 1.909 (the standardized effect was 0.355, medium effect size) for FCGs. The actor effects were positive indicating that higher hope scores in patients and FCGs predicted their own better physical domain of QoL. Hope had no significant effect on the partner's Physical domain of QoL in both members of the dyad.

Association between hope and the psychological domain of QoL

Hope scores showed only actor effect on the Psychological domain of QoL in both patients and FCGs (p values < 0.001 for both members of the dyad, Fig. 2, Table 3). The actor effect was 3.044 (the standardized effect was 0.673, large effect size) for patients and 1.956 (the standardized effect was 0.432, medium effect size) for FCGs. The actor effect for both patients and FCGs was positive indicating that higher hope scores predicted a better Psychological domain of QoL. The partners' effects for both members of the dyad were not statistically significant (Fig. 2, Table 3).

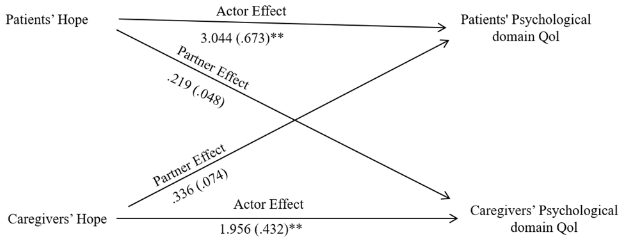

Fig. 2 The estimated actor and partner effects (and the standardized effect) of Hope scores as a predictor of the Psychological domain of QoL using the Actor–Partner Interdependence Model. *p value < 0.05, **p value < 0.001

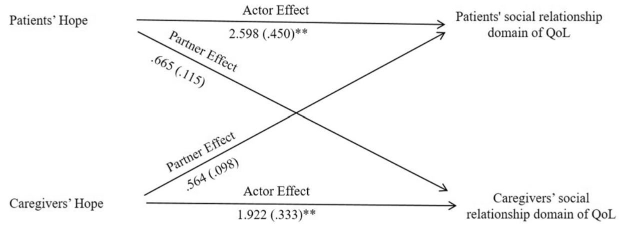

Fig. 3 The estimated actor and partner effects (and the standardized effect) of Hope scores as a predictor of the Social relationships domain of QoL using the Actor–Partner Interdependence Model. *p value < 0.05, **p value < 0.001

Association between hope and the social relationships domain of QoL

Hope scores exhibited significant actor effect (p values < 0.001 for both members of the dyad), but not partner effect on Social Relationships domain of QoL in both patients and FCGs (Fig. 3, Table 3). The actor effect was 2.598 (the standardized effect was 0.450, medium effect size) for patients and 1.922 (the standardized effect was

Table 3 Actor and partner effects of hope on QoL in patients–FCG dyads (n = 123)

QoL domain: type of effect	Patients (n = 123)			Caregivers (n = 123)		
	Effect (β)	t*	p	Effect (β)	t*	p
Physical: actor	2.586 (0.481)	5.693	< 0.001	1.909 (0.355)	4.17	< 0.001
Physical: partner	− 0.389 (− 0.072)	− 0.914	0.363	0.653 (0.121)	1.337	0.184
Psychological: actor	3.044 (0.673)	8.585	< 0.001	1.956 (0.432)	5.719	< 0.001
Psychological: partner	0.336 (0.074)	1.012	0.314	.219 (0.048)	0.601	0.549
Social Relationships: actor	2.598 (0.450)	5.436	< 0.001	1.922 (0.333)	3.835	< 0.001
Social Relationships: partner	0.564 (0.098)	1.258	0.211	0.665 (0.155)	1.245	0.216
Environment: actor	2.451 (0.567)	6.520	< 0.001	1.065 (0.246)	3.085	0.002
Environment: partner	− 0.005 (− 0.001)	− 0.014	0.989	.958 (0.222)	2.603	0.010

df was 120

0.333, medium effect size) for FCGs. The actor effect for both members was positive indicating that higher hope scores in both patients and FCGs predicted their own better Social Relationships domain of QoL.

Association between hope and the environment domain of QoL

Hope scores demonstrated actor effect on the Environmental domain of QoL in both patients ($p < 0.001$, Fig. 4, Table 3) and FCGs ($p = 0.002$). The actor effect was 2.451 (the standardized effect was 0.567, large effect size) for patients and 1.065 (the standardized effect was 0.246, small effect size) for FCGs. The actor effect for both members was positive indicating that higher hope scores in both patients and FCGs predicted their own better Environmental domain of QoL. Hope scores demonstrated partner effect on the Environmental domain of QoL in patients only (the effect was 0.958, the standardized effect was 0.222, small effect size, p values = 0.01). The effect size was positive indicating that higher hope scores in patients predicted better Environmental domain of QoL in FCGs. More specifically, FCGs who provide home care to patients with higher hope scores had better Environmental domain of QoL. No partner effect of hope was observed in FCGs on patients' Environmental domain of QoL.

Discussion

This paper is among the few research papers focused on positive concepts related to home-based caregiving and the management of chronic illnesses. To the best of our knowledge, this is the first study to examine the concepts of hope and QoL at the dyad level. Using the APIM dyadic analysis, we found that hope in patients and FCGs had a positive association with all of their own dimensions of QoL. As hope level increases, an individual's own Physical, Psychological, Social Relationship, and Environmental dimension of QoL tend to be better. These findings are in line with the results of most of the previous studies in patients with ESRD receiving HD [9, 29] and in different FCGs' populations [10, 11].

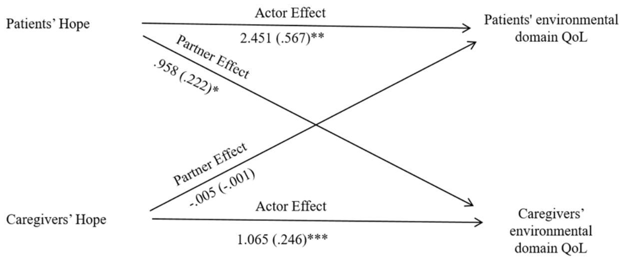

Fig. 4 The estimated actor and partner effects (and the standardized effect) of Hope scores as a predictor of the Environment domain of QoL using the Actor–Partner Interdependence Model. *p value < 0.05, **p value < 0.001, ***p value = 0.002

Cha and Han (2014) found that hope (measured by HHI) has a statistically significant relationship with QoL (as measured by Satisfaction with Life Scale) in 100 adult patients on HD and it significantly predicted and explained about 43% of the variance in QoL scores [9]. Similarly, Shirazi et al. [29] found a significant positive correlation between hope and QoL ($r = 0.25$, $p < 0.05$) in 66 patients on dialysis. However, only one subscale of hope (Agency thinking but not the Pathways thinking subscale) significantly predicted QoL in the stepwise regression analysis. The predictor of Agency thinking reflects one's own perception of the capability to do things to achieve the desired goals [29]. The authors concluded that the QoL of patients could be improved by increasing their hope levels.

In FCGs, Ghahremani et al. [11] found a significant positive correlation ($r = 0.679$, $p = 0.000$) between hope (measured by Miller Hope Scale) and QoL (measured by QoL Family Version) in 260 FCGs of patients with schizophrenia. Similarly, Duggleby et al. [10] found that the overall QoL (question number 1 on WHOQoL BREF) and the four domains of QoL in 80 FCGs of patients with Alzheimer's disease had significant positive associations with some of the HHI subscale scores. Specifically, the subscale of temporality and future (cognitive-temporal dimension reflecting the person perception that there are achievable goals in his life each day) was a significant predictor of the overall QoL scores and the Psychological and Environmental domains of QoL. The subscale of positive readiness and expectancy (affective-behavioral dimension reflecting the person's perception that he/she performs the behavior to achieve goals and the confidence of the adequacy of the behavior in achieving goals) was a significant predictor of the Physical domain of QoL. The subscale of interconnectedness (affiliative-contextual dimension which reflects person perception of faith, deep inner strength, spiritual and social support) was a significant predictor of the Psychological and Social Relationships domains of QoL [10].

In the patient–FCG dyads, we found that the individual's hope was not associated with their partner's Physical, Psychological, and Social relationships domains of QoL. In these domains, patients and FCGs showed only actor effect (actor-oriented) [30] implying that their scores on the mentioned domains of QoL were linked only to their own hope scores (not their partners' hope scores). Interestingly, patients' hope scores showed a partner effect on the Environmental domain of QoL of the FCGs. This finding indicates that higher hope scores in patients were connected to better Environmental QoL domain in FCGs. Thus, FCGs' scores on the Environmental domain of QoL were associated with their own hope and with their partners' (patients') hope scores. A probable explanation of this finding could be that the high level of hope in patients may promote their feelings of well-being and better QoL in all domains including the Environmental domain and decrease the negative or overwhelming effects of caregiving on FCGs. Consequently, the FCGs' feelings of freedom and satisfaction, physical safety and security in the daily life, and accessibility to health care for using health care services, recreation, and leisure activities may be improved. Nevertheless, the nature of this relationship and its explanation should be examined in future studies.

There is no clear understanding of the underlying mechanisms on how hope affects QoL neither at the individual nor at the dyad level. However, the findings of other studies at the dyad level may help explain the findings of our study. Rock et al. [31] found that higher levels of hope in patients with advanced breast cancer and their partners predicted greater patient's marital satisfaction. Marital satisfaction, in turn, may positively enhance people's perceptions of their QoL. In addition, the significant negative relationship between hope and depression [9], which has shown a negative correlation with QoL in patients receiving HD [4], also may explain our findings. In this relationship, as the level of hope increases, the level of depression decreases and thus QoL improves. Furthermore, the findings of three recent studies indicated that using effective coping strategies (such as social support, avoidance, and problem-focused strategies) in dyads of patients and their FCGs were associated with positive effects on their partners' QoL [32–34]. Although the concept of hope was not examined in these three studies, the connections between effective coping strategies and QoL could explain the relationship between hope and QoL. Effective coping has shown a positive relationship with both QoL and hope in FCGs of patients with schizophrenia at the individual level and was recommended for improvements of QoL and hope levels [11]. So, it is possible that effective coping strategies demonstrate their positive effects on the participants' level of hope and, in turn, improve their QoL. Examining these relationships at the dyadic level in future studies is highly recommended.

There are many interventions that may improve the level of hope. Poorgholami et al. [35] found in a single-blinded randomized controlled clinical trial that self-care education and self-care education plus telephone follow-up were associated with a significantly better level of hope in HD patients with a significantly better hope scores for patients who received self-care education supplemented with telephone follow-up. Thus, providing education for HD patients and finding an appropriate way for following them up may enhance the level of hope in patients and FCGs. In addition, healthcare professionals can use assurance in individuals about their conditions as it may improve hope, but professionals should avoid false reassurance that has a negative effect on individuals [16]. Instead, Scanlon [16] suggested many activities that could promote hope in terminally ill people with cancer and their FCGs and could be applied to patients with other chronic illnesses and their FCGs. These activities include frequent hope and psychological assessment, providing emotional support, setting healthcare-related goals and priorities. They also involve teaching and creating an environment that maximizes self-worth and human potentials. In addition, strategies such as sustaining supportive relationships, cognitive reframing (reframing of threatening perceptions), time refocusing, attainable expectations, spiritual beliefs (achieved by spiritual practices and activities), and uplifting energy were identified by FCGs of terminally ill patients as hope fostering strategies [12]. Moreover, FCGs identified three factors that interfere with or inhibit maintaining hope. These factors include isolation, concurrent losses, and fears accompanied by poorly controlled management of symptoms [12]. Accordingly, healthcare professionals, including community nurses, can improve the level of hope in FCGs and HD patients by establishing supportive relationships with them, reassessing perceived challenges or conditions causing stress and seeing these as opportunities for improvements. They could also help with focusing on their current life and not to worry about the future, as well as help with establishing appropriate expectations and achievable goals, and discussing about spiritual practices and activities.

Our study has many points of strength. It is the first study to examine the relationship between hope and QoL at the dyadic level in any population of individuals in a close relationship. The study opens the door to this area of research. The APIM dyadic approach used in our study allows for statistically controlling the interdependence between the members of the dyad, and this is a major strength in our study. In addition, using reliable and valid instruments to measure variables under investigation further validates our findings. Using these instruments and the APIM dyadic approach unlocked this field of research, as our study has the potential to identify further predictors of QoL in patients and their FCGs as well as in individuals in a close relationship. Also, a better understanding of the ways in which patients and their FCGs may influence each other may help in developing and testing of interventions targeting both of them (couple-focused). However, we acknowledge that our study has some limitations and so we should be cautious when interpreting such results. First, the purposive convenience sampling may hinder the generalizability of findings to the whole population of ESRD patients on HD and their FCGs. However, we purposively selected participants based on specific characteristics such as age ≥ 18 years, no terminal illnesses, and being on HD (patients) or a caregiver for at least 3 months which are difficult to attain based on random sampling. However, our sample looks very representative to ESRD patients when it is compared with the available data on ESRD registry in the country [36]. All of the comparisons between the data of patients in ESRD registry with our sample (shown as "vs" our sample data) including patients' mean age of 53 years (vs 49 years), 40.1% were female (vs 43.1%), 72.3% married (vs 69.9%), 17.5% single (vs 25.2%), 10.3% divorced or widowed (vs 4.9%), 17.3% employed (vs 22.8%), 60% had history of hypertension (vs 47.2%), 40.2% had history of diabetes (vs 26.8%), and 13.3% had history of cardiac diseases (vs 15.4%) indicated the similarity. Second, having different relationships between patients and their FCGs (e.g., spousal or parental relationships) also might affect the findings. Such relationships should be considered in future studies. Third, the nature of the cross-sectional study does not permit the establishment of the causality in the examined relationships. Lastly, other variables that may have associations with QoL were not controlled in this study due to the univariate nature of the APIM. Age, gender, depression, anxiety, education level, and caregiving burden are examples of factors at the individual level that may influence QoL [8]. In addition, dyadic level factors such as depression, anxiety [37], and sleep disturbance [38] have shown a partner effect on the QoL in heart failure patient–spousal FCG dyads and so should be considered in future studies.

Implications and conclusion

The findings of this study have several implications. The findings emphasize the importance of frequent assessment of hope levels in both patients and their FCGs and the importance of early intervention to increase the level of hope as this might improve the QoL in both patients and their FCGs. The findings also signify the importance of using the dyadic approach in future research as well. Furthermore, future longitudinal studies (to better establish the causality) examining changes in the level of hope as well as how the level of hope may influence QoL are warranted. This study emphasizes that all dimension of the QoL of patients and their FCGs is directly associated with their own level of hope. The findings also suggested that the Environmental dimension of QoL in FCGs might be linked to the level of hope in patients. Moreover, intervention targeting improving QoL through hope may need to be couple-focused to achieve the greatest benefits.

Acknowledgements We used The Actor–Partner Interdependence Model (APIM) using multilevel modeling (APIM_MM) app program in dyadic data analysis which was written by David A. Kenny. This study was financially supported by the Deanship of Scientific Research—The Hashemite University.

Author contributions A-R with AA developed and designed the study, and supervised data collection. A-R analyzed the data and wrote the first draft of the introduction, methods, and results sections. MR wrote the first draft of the discussion section. AA with AA wrote the abstract and the conclusion parts, revised, and proofread the final version of the paper. A-R did the whole supervision. All authors have contributed sufficiently in the production of this manuscript in terms of data collection, analysis, interpretation, and writing and they are in agreement with the content of the manuscript.

Compliance with ethical standards

Conflict of interest All authors declare that they have no conflict of interest.

References

1. Schoolwerth, A. C., Engelgau, M. M., Rufo, K. H., Vinicor, F., Hostetter, T. H., Chianchiano, D., et al. (2006). Chronic kidney disease: A public health problem that needs a public health action plan. *Preventing chronic disease, 3*(2), 1–6.
2. Centers for Diseases Control and Prevention. (2019). *Chronic kidney disease in the United States, 2019: National Chronic Kidney Disease Fact Sheet, 2017*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention.
3. Malekmakan, L., Tadayon, T., Roozbeh, J., & Sayadi, M. (2018). End-stage renal disease in the Middle East: A systematic review and meta-analysis. *Iranian Journal of Kidney Diseases, 12*(4), 195.
4. Kimmel, P. L., & Peterson, R. A. (2005). Depression in end-stage renal disease patients treated with hemodialysis: Tools, correlates, outcomes, and needs. *Seminars in Dialysis, 18*(2), 91–97. https://doi.org/10.1111/j.1525-139X.2005.18209.x.
5. Shdaifat, E. A., & Manaf, M. R. A. (2012). Quality of life of caregivers and patients undergoing haemodialysis at Ministry of Health, Jordan. *International Journal of Applied Science and Technology, 2*(3), 75–85.
6. Dąbrowska-Bender, M., Dykowska, G., Żuk, W., Milewska, M., & Staniszewska, A. (2018). The impact on quality of life of dialysis patients with renal insufficiency. *Patient Preference and Adherence, 12,* 577. https://doi.org/10.2147/PPA.S156356.
7. Gilbertson, E. L., Krishnasamy, R., Foote, C., Kennard, A. L., Jardine, M. J., & Gray, N. A. (2019). Burden of care and quality of life among caregivers for adults receiving maintenance dialysis: A systematic review. *American Journal of Kidney Diseases, 73*(3), 332–343. https://doi.org/10.1053/j.ajkd.2018.09.006.
8. Gray, N. A., Zuo, L., Hong, D., Smyth, B., Jun, M., De Zoysa, J., et al. (2019). Quality of life in caregivers compared with dialysis recipients: The Co-ACTIVE sub-study of the ACTIVE dialysis trial. *Nephrology*. https://doi.org/10.1111/nep.13530.
9. Cha, J., & Han, D. (2014). Factors related to hope and relationships between hope, physical symptoms, depressive mood and quality of life in young adult and prime-aged patients with hemodialysis. *Journal of Korean Academy of Psychiatric and Mental Health Nursing, 23*(4), 250–258. https://doi.org/10.12934/jkpmhn.2014.23.4.250.
10. Duggleby, W. D., Swindle, J., Peacock, S., & Ghosh, S. (2011). A mixed methods study of hope, transitions, and quality of life in family caregivers of persons with Alzheimer's disease. *BMC Geriatrics, 11*(1), 88. https://doi.org/10.1186/1471-2318-11-88.
11. Ghahremani, Z., Alavi, M. J., Gholam Araghi, M., & Hosseini, F. (2006). Correlates of quality of life in the family caregivers of

schizophrenic patients with hope. *Iran Journal of Nursing, 19*(45), 17–26.

12. Herth, K. (1993). Hope in the family caregiver of terminally ill people. *Journal of Advanced Nursing, 18*(4), 538–548. https://doi.org/10.1046/j.1365-2648.1993.18040538.x.
13. Rustøen, T. (1995). Hope and quality of life, two central issues for cancer patients: A theoretical analysis. *Cancer Nursing, 18*(5), 355–361.
14. Kelley, H. H., & Thibaut, J. W. (1978). *Interpersonal relations: A theory of interdependence*. New York: Wiley.
15. Vellone, E., Dellafiore, F., Chung, M. L., & Alvaro, R. (2018). Mutuality and self-care in heart failure patient and caregiver dyads. *European Journal of Cardiovascular Nursing, 17*(5), 467–468. https://doi.org/10.1177/1474515117740482.
16. Scanlon, C. (1989). Creating a vision of hope: The challenge of palliative care. *Oncology Nursing Forum, 16*(4), 491–496.
17. Kenny, D., Kashy, D., & Cook, W. (2006). *Dyadic data analysis*. New York: Guilford Press.
18. Sterba, K. R., Zapka, J., Cranos, C., Laursen, A., & Day, T. A. (2016). Quality of life in head and neck cancer patient-caregiver dyads: A systematic review. *Cancer Nursing, 39*(3), 238–250. https://doi.org/10.1097/NCC.0000000000000281.
19. Herth, K. (1990). Fostering hope in terminally-ill people. *Journal of Advanced Nursing, 15*(11), 1250–1259. https://doi.org/10.1111/j.1365-2648.1990.tb01740.x.
20. Herth, K. (2000). Enhancing hope in people with a first recurrence of cancer. *Journal of Advanced Nursing, 32*(6), 1431–1441. https://doi.org/10.1046/j.1365-2648.2000.01619.x.
21. Herth, K. (1992). Abbreviated instrument to measure hope: Development and psychometric evaluation. *Journal of Advanced Nursing, 17*(10), 1251–1259. https://doi.org/10.1111/j.1365-2648.1992.tb01843.x.
22. Hunsaker, A. E., Terhorst, L., Gentry, A., & Lingler, J. H. (2016). Measuring hope among families impacted by cognitive impairment. *Dementia, 15*(4), 596–608. https://doi.org/10.1177/1471301214531590.
23. World Health Organization Quality of Life Group. (1998). Development of the World Health Organization WHOQOL-BREF quality of life assessment. *Psychological Medicine, 28*(3), 551–558. https://doi.org/10.1017/S0033291798006667.
24. World Health Organization. (1996). *WHOQOL-BREF: Introduction, administration, scoring and generic version of the assessment: field trial version, December 1996*. Geneva: World Health Organization.
25. Ohaeri, J. U., & Awadalla, A. W. (2009). The reliability and validity of the short version of the WHO quality of life instrument in an Arab general population. *Annals of Saudi Medicine, 29*(2), 98. https://doi.org/10.4103/0256-4947.51790.
26. Dalky, H. F., Meininger, J. C., & Al-Ali, N. M. (2017). The reliability and validity of the Arabic World Health Organization Quality of Life-BREF instrument among family caregivers of relatives with psychiatric illnesses in Jordan. *Journal of Nursing Research, 25*(3), 224–230. https://doi.org/10.1097/jnr.0000000000000146.
27. Kenny, D. A. (1996). Models of non-independence in dyadic research. *Journal of Social and Personal Relationships, 13*(2), 279–294. https://doi.org/10.1007/978-3-319-28099-8_1197-1.
28. Li, L.-R., Lin, M.-G., Liang, J., Hu, Q.-Y., Chen, D., Lan, M.-Y., et al. (2017). Effects of intrinsic and extrinsic factors on the level of hope and psychological health status of patients with cervical cancer during radiotherapy. *Medical Science Monitor: International Medical Journal of Experimental and Clinical Research, 23,* 3508. https://doi.org/10.12659/MSM.901430.
29. Shirazi, M., Chari, M., Kahkha, S. J., & Marashi, F. (2018). The role of hope for the future and psychological hardiness in quality of life among dialysis patients. *Jentashapir Journal of Health Research*. https://doi.org/10.5812/jjhr.67827.
30. Kenny, D., & Cook, W. (1999). Partner effects in relationship research: Conceptual issues, analytic difficulties, and illustrations. *Personal relationships, 6*(4), 433–448. https://doi.org/10.1111/j.1475-6811.1999.tb00202.x.
31. Rock, E. E., Steiner, J. L., Rand, K. L., & Bigatti, S. M. (2014). Dyadic influence of hope and optimism on patient marital satisfaction among couples with advanced breast cancer. *Supportive Care in Cancer, 22*(9), 2351–2359. https://doi.org/10.1007/s00520-014-2209-0.
32. Lafaye, A., Petit, S., Richaud, P., Houédé, N., Baguet, F., & Cousson-Gélie, F. (2014). Dyadic effects of coping strategies on emotional state and quality of life in prostate cancer patients and their spouses. *Psycho-Oncology, 23*(7), 797–803. https://doi.org/10.1002/pon.3483.
33. Baumstarck, K., Leroy, T., Hamidou, Z., Tabouret, E., Farina, P., Barrie, M., et al. (2016). Coping with a newly diagnosed high-grade glioma: Patient-caregiver dyad effects on quality of life. *Journal of Neuro-oncology, 129*(1), 155–164. https://doi.org/10.1007/s11060-016-2161-6.
34. Lazzarotto, S., Martin, F., Saint-Laurent, A., Hamidou, Z., Aghababian, V., Auquier, P., et al. (2019). Coping with age-related hearing loss: Patient-caregiver dyad effects on quality of life. *Health and Quality of Life Outcomes, 17*(1), 86. https://doi.org/10.1186/s12955-019-1161-6.
35. Poorgholami, F., Mansoori, P., Montaseri, Z., & Najafi, K. (2016). Effect of self care education with and without telephone follow-up on the level of hope in renal dialysis patients: A single-blind randomized controlled clinical trial. *International Journal of Community Based Nursing and Midwifery, 4*(3), 256.
36. As-Sayaideh, A., Al-Qaisi, S., Asad, M., & National Registry of End Stage Renal Disease -Jordan (2016). Non-communicable Diseases Directorate - Ministry of Health-Jordan National Registry of End Stage Renal Disease (ESRD): Annual Report 2015.
37. Chung, M. L., Moser, D. K., Lennie, T. A., & Rayens, M. K. (2009). The effects of depressive symptoms and anxiety on quality of life in patients with heart failure and their spouses: Testing dyadic dynamics using Actor-Partner Interdependence Model. *Journal of Psychosomatic Research, 67*(1), 29–35. https://doi.org/10.1016/j.jpsychores.2009.01.009.
38. Al-Rawashdeh, S. Y., Lennie, T. A., & Chung, M. L. (2017). The association of sleep disturbances with quality of life in heart failure patient-caregiver dyads. *Western Journal of Nursing Research, 39*(4), 492–506. https://doi.org/10.1177/0193945916672647.