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# Assessment of quality of life among Iranian hemodialysis patients: A multicenter study

Sara Rahimi[1*], Mojgan Baghaei[2], Mahboobe Shali[3], Leila dehghankar[4], Hossein Rafiei[5]

[1,4,5] M.Sc. in nursing education, Faculty of Nursing and Midwifery, Qazvin University of Medical Sciences, Qazvin, Iran
[2] M.Sc. in nursing education, faculty member, Social determinants of Health Research Center, Guilan university of Medical Science, Rasht, Iran.
[3] PhD student Faculty of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran

***Correspondence to**: Sara Rahimi
. **Email**: rahimi.qums@yahoo.com

***Abstract:*** **Background and Aim: Hemodialysis is accompanied by various physical, mental, social, and economic problems that may affect patients' quality of life. Therefore, evaluation of this variable and its related factors can be beneficial in achieving the care objectives. This study aimed to determine the quality of life and its demographic, physical, and treatment-related factors in patients referring to hemodialysis centers of Guilan University of Medical Sciences, Iran.**

**Methods: In this cross-sectional, analytical study, 241 adult patients with determined inclusion criteria were selected from 12 dialysis centers in Guilan provience by systematic randomized method. The study data were gathered using a researcher-made questionnaire including demographic, physical and treatment-related features as well as the Persian version of Kidney Disease Quality of Life Short Form (KDQOL-SF) scored from 0 to 100 into physical and mental dimensions and kidney components by self-reporting method. Higher KDQOL represented better life quality. Descriptive and inferential statistics were used to determine the relationship between the total quality of life and the factors related to its dimensions.**

**Results: The patients' quality of life score was 54.00±13.33 that had significant relationship with female gender (P<0.0001), old age (P<0.002), low education levels (P<0.0001), Unemployment (P<0.0001), not being the household head (P<0.003), living in rural areas (P<0.043), without history of kidney transplantation (P<0.038), dialysis center (P<0.019), higher Charlson's comorbidity index (<0.0001), lower hemoglobin levels (P<0.011)and hematocrit levels (P<0.042). The results of regression analysis indicated that female gender, Unemployment, and higher Charlson's comorbidity index are the predictors of hemodialysis patients' low quality of life.**

**Conclusion: The relationship between the hemodialysis patients' low quality of life and controllable factors highlights the necessity of special plan to improve patients' quality of life by social support and medical interventions.**

***Keywords:*** **Hospitalized patients, End-stage renal disease, Predicting factors, Quality of life, Hemodialysis.**

## 1. INTRODUCTION

Chronic Renal Disease (CKD) involves a wide range of pathological processes with significant reduction in glomerular filtration rate (1). Globally, estimated prevalence of CKD is 7.2% in adults over the age of 30 years (2) that almost, 90% of the suffered patients were treated by hemodialysis (HD) (3). The number of patients undergoing hemodialysis is also increasing in Iran. Now, 28,000 patients in Iran are under HD and its prevalence will increase to 90,000 by 2021 (4). Despite the substantial resources committed to the treatment of CKD and significant improvements in the quality of dialysis therapy, patients continue to experience significant mortality and morbidity and reduced quality of life (5).

The World Health Organization(WHO) has defined QOL as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns"(2). In fact, QOL is an important outcome that is used as a valuable parameter of health and well-being(6). Research findings have shown that lower scores on QOL were strongly associated with higher risk of death and hospitalization than clinical parameters such as serum albumin levels in cases of CKD patients (5).This is despite the facts obtained from various studies that have shown the patient with CKD had lower QOL compared to the healthy individuals (7, 8, 9, 10).Therefore, improving CKD patients' life span as well as QOL is of utmost importance (11). In this way, many factors need to be considered. There is an ever expanding body of literature related to various factors that affect QOL, like genetic, environmental, psychosocial, stress, emotional, and comorbidities (5).

Considering the importance of QOL and the necessity to identify its effective factors, a large number of studies have been performed in this area. For instance, Chiang et al., reported that QOL was significantly higher among the males compared to the females patients treated by HD (12). However, Hesieh et al., Tel et al., and Lopes et al., studies on HD patients showed that the males had a poorer QOL compared to the females (13, 14, 15). In the researches by Tel et al and Lessan-Pezeshki et al., married patients had a higher QOL compared to the single ones (14, 16). In the study by Acaray & Pinar, however, QOL of the single patients was higher than that of the married ones (17). On the other hand, some studies have revealed no significant association between QOL and marital status (18). With respect to age, some researchers have demonstrated that older patients had a lower QOL compared to the younger ones (10, 19), while some others have come to an opposite conclusion (20). Yet, some studies have indicated no significant relationship between hemodialysis patients' age and QOL (18). These contradictory results are not only related to demographic features, but they also involve the treatment-related factors, physiological factors, and laboratory parameters. For instance, Hesieh et al., found no significant correlation between QOL and biochemical variables and dialysis adequacy (13), while Wen Mau etal. showed a significant relationship between these parameters(21). Furthermore, some studies have revealed a difference in QOL among the patient with different races and ethnicities undergoing dialysis in different dialysis centers or geographical regions (even among the patients of a similar race living in two different geographical locations). In this regard, Yang et al., examined the dialysis patients' QOL in 13 dialysis centers in Taipei and Keelung, Taiwan. After adjusting the patients' age, sex, education level, marital status, and other clinical indexes, the QOL scores of the patients living in Taipei were significantly lower than the scores of those living in Keelung. However, Taipei is the capital of Taiwan and the patients living in this city were expected to have higher QOL (6).

Since, health system should make attempts to improve the patients' medical and treatment outcomes and QOL through cost-effective care programs (4). In this way, regular QOL monitoring would both improve communication between the patients and the managing team and is useful in the assessment of patient's needs (22). Hence, this study was done with the aim of determining QOL and its predicting factors in adult HD patients referring to centers affiliated to Guilan University of Medical Sciences, Iran.

## 2. METHODS

This cross-sectional, analytical study was conducted on adult HD patients in dialysis centers affiliated to Guilan University of Medical Sciences in 2012.Two hundred and forty-one HD patients were selected by stratified randomized method between January and March 2012. In this way samples with respect to the number assigned to each center were randomly selected from 12 dialysis centers in Guilan province from all dialysis shifts. Inclusion criteria of the study were Iranian patients suffering from CKD on ,at least, regular twice a week hemodialysis for more than three months or more or who had received renal transplant at least six months prior to enrollment into the study; aged at least 18 years old of either sex; able to speak, read and write the local language, or Persian ; having vascular access through fistula; no history of known mental disorders (according to the patients' self-reports), hepatitis B and C, or acute physical conditions restricting active cooperation in the study and requiring hospitalization and be able to provide informed consent to participate in the study. Selected samples were able to reject participation in study, whenever they want to.

The study data were collected using a 2-part instrument including a researcher-made questionnaire about demographic, physical and treatment-related factors; and standard Kidney Disease Quality Of Life-Short Form (KDQOL-SF). The first section of instrument was a questionnaire including demographic information (age, sex, marital status, education level, occupation, monthly income, social support, being the household head, living place, the primary cause of the disease,

Body Mass Index [BMI], history of smoking, number of cigarettes smoked per day and history of kidney transplantation), physical factors(including pre-dialysis blood pressure, weight gain between two dialysis sessions and some laboratory parameters such as hemoglobin, hematocrit, calcium, phosphorus, potassium, blood urea nitrogen(BUN), and serum creatinin) and treatment-related factors (number of dialysis sessions per week, years on dialysis, usual dialysis shift, travel time to dialysis center and type of dialysis filter). Also, Charlson's comorbidity index is added to physical factors questionnaire for assessing comorbidities in HD patients. Charlson's comorbidity index was used for evaluating comorbidity status. This index has ranked 12 diseases with respect to their potential effects on mortality. The score of Charlson's comorbidity index (ranging from 0 to 37) was matched with age and then, one point was added to the sum of the obtained score per each 10 year increase in age (23). After all, based on the obtained scores, the patients' status was ranked to 4 classes (class 0 (or without comorbidities), class one (scores 1-2), class two (scores3-4), class three (scores5-7) and class four (scores ≥8)).

KDQOL-SF is a standard self-report instrument consisting 19 subscales were grouped into three main domains. These domains are a) Physical health components summary (PCS) including physical functioning (10 items), role-physical (4 items), pain (2 items), and general health (5 items) subscales; b) Mental health components summary (MCS) including energy/fatigue (4 items), social functioning (2 items), role emotional (5 items), and emotional well-being (3 items)subscales and c) Kidney disease component summary (KDCS) consisting symptom / problem list (12 items), effects of kidney disease (8 items), burden of kidney disease (4 items), cognitive function (4 items), work status (2 items), sexual function (2 items), quality of social interaction (3 items), sleep (4 items), social support (2 items), dialysis staff encouragement (2 items) and patient satisfaction (1item)subscales. All subscales as well as domains and total QOL are presented as scores between 0 and 100, with higher score reflecting better quality of life. This instrument was developed by Hays et al. in 1994 and has been translated to different languages (24). In Iran, KDQOL-SF was translated into Persian according to the Iranian culture by Pakpour et al., in 2011 and its reliability was approved by Cronbach's alpha of 0.71-0.93 (25).

Data gathering methods were recording the patients' information, extracted from their records; measuring their height and blood pressure by researchers and self-reporting of KDQOL-SF by samples, after signing the written informed consent by them. Data were entered into the SPSS statistical software (v. 16) and analyzed using descriptive (frequency distribution, mean, and SD) and inferential statistics (independent t-test, one-way ANOVA, Pearson correlation coefficient, and linear regression) to determine the predictors of QOL.

## 3. RESULTS

In our study population 62.7% were aged ≥50 years and 66% was male. The predominant cause of end-stage renal disease was hypertension (32.4%).

QOL results are presented in Table 1. The mean and SD score of the QOL of samples was 54+13.33. Moreover, the highest and lowest means of KDCS were related to patient satisfaction (20.20±80.29) and work status (19.10±2.90), respectively. Besides, the mean score of PCS (46.99±1.94) was lower than that of MCS (48.76±1.80) and KDCS (58.41±1.03).

Comparisons of KDQOL-SF scale scores by selected patient demographic, physical and treatment-related factors shown in Table 2. patients aged 50 years and more had significantly lower scorein7 out of 19 KDSQOL-SF subscales including physical functioning($P<0.001$), general health ($P<0.006$), social functioning ($P<0.043$), energy/fatigue ($P<0.0001$), symptoms ($P<0.015$), cognitive functioning ($P<0.050$), and sleep ($P<0.017$) subscales; and PCS ($P<0.0001$), MCS ($P<0.0014$), and KDCS ($P<0.012$) domains. The results also revealed a significant relationship between female gender and low QOL in physical function ($P<0.001$), pain ($P<0.015$), general health ($P<0.0001$), emotional well-being ($P<0.006$), role- emotional($P<0.024$), social function ($P<0.005$), energy/fatigue ($P<0.008$), symptoms ($P<0.0001$), effect of kidney disease ($P<0.025$), and burden of the disease ($P<0.003$) subscales and PCS ($P<0.005$), MCS ($P<0.0001$), and KDCS ($P<0.003$) domains. Comparison of KSQOL-SF scores by education level demonstrated a significant influence of lower education levels in physical function ($P<0.010$), emotional well-being ($P<0.0001$), social function ($P<0.0001$), energy/fatigue ($P<0.0001$), symptoms ($P<0.001$), burden of the disease ($P<0.0001$), and sleep ($P<0.016$) subscales and PCS ($P<0.002$), MCS ($P<0.0001$), and KDCS ($P<0.013$) domains.

The study results showed that married patients had higher scores compared to the single ones in all the dimensions and almost all the subscales; however, the difference was not statistically significant. Also, unemployed samples scores in KDQOL-SF was significantly lower in role- physical (P<0.035), emotional well-being(P<0.001), social function(P<0.025), energy/fatigue (P<0.0001), symptoms (P<0.002), effect of kidney disease (P<0.008), burden of the disease (P<0.0001), work status (P<0.0001), and social support (<0.031) subscales and PCS (P<0.003), MCS (P<0.001), and KDCS (P<0.0001) domains, in comparison to homemakers/disabled, employees, and retired patients. Higher monthly income was significantly associated with higher mean scores in physical function (P<0.018) and cognitive function (P<0.014) subscales. In addition, social support by Kidney Patients association along with general insurance was significantly associated to higher mean scores in physical function (P<0.005)and sleep (P<0.044) subscales. Besides, household heads had significantly higher mean scores in pain (P<0.039), general health perception (P<0.015), emotional well-being (P<0.004), social function (P<0.001), symptoms (P<0.001), and effect of kidney disease (P<0.032) subscales and PCS (P<0.012), MCS (P<0.001), and KDCS (P<0.026) domains.

The findings showed that the patients who lived in urban areas had significantly higher QOL scores in emotional well-being (P<0.001), energy/fatigue (P<0.035), burden of kidney disease (P<0.006), work status (P<0.022), and social support (P<0.046) subscales and PCS (P<0.013), MCS (P<0.037), and KDCS (P<0.058) domains.

Regarding the primary cause of kidney disease, the highest mean score was related to role- emotionalwith congenital reasons (P<0.050) and sexual function with glomerulonephritis (P<0.043), while the lowest mean score was related to work status with kidney stone etiology (P<0.001).

There were no significant correlation between BMI and total QOL and its subscales or domains. Smoking had significant relationship only with physical functioning subscale (P<0.024).Furthermore, cigarettes numbersper day in smokers significantly correlated with pain subscale score(P<0.048). Accordingly, the patients who smoked 10cigarettes a day and more had higher scores in pain subscale compared to those who smoked less than 9 cigarettes per day. Besides, the history of kidney transplantation was significantly associated with higher scores in physical functioning (P<0.006) and symptoms (P<0.004) subscales.

Concerning the dialysis centers, the patients referring to Astara dialysis center obtained the highest mean scores in total QOL (P<0.019) and KDCS domain(P<0.001). Moreover, the patients referring to Roudbar dialysis center gained the highest mean scores in PCS domain (P<0.040).

Furthermore, the results of univariate analysis revealed a significant direct relationship between total KDQOL and male gender (P<0.0001), ≤50 years ages (P<0.002), higher education levels (P<0.0001), occupation (P<0.0001), being the household head (P<0.003), living in urban areas (P<0.043), history of kidney transplantation (P<0.038), and dialysis center (P<0.019). In addition, unemployed patients obtained significantly lower QOL scores compared to homemaker, employed, and retired ones (P<0.0001). Nevertheless, no significant relationship was observed between total KDQOL and marital status, income, social support, primary cause of the disease, BMI, smoking, and number of cigarettes smoked per day.

Analysis of physical factors revealed that Charlson's comorbidity index was significantly associated with lower scores in total QOL (P<0.0001), PCS (P<0.0001), MCS (P<0.0001), and KDCS (P<0.003) domains, and physical functioning, general health perception, role- emotional problems, social function, fatigue/energy, symptoms, cognitive function, quality of social interactions, and sleep subscales.

The results also indicated a significant relationship between higher means of pre-dialysis systolic blood pressure (SBP) and lower score in sexual functioning subscale in KDCS domain (P<0.015). However, no significant relationship was found between the patients' pre-dialysis diastolic blood pressure (DBP) and QOL. The results of Pearson analysis showed that increase in the patients' mean of serum hemoglobin level resulted in a significant increase in their scores of total KDQOL (P<0.011), PCS domains (r=0.197, P<0.002), and physical functioning (r=0.188, P<0.003), role limitation due to physical problems(r=0.147, P<0.023), energy/fatigue (r=0.131, P<0.042), and symptoms (r=0.149, P<0.021) subscales. Also, increase in serum hematocrit level led to a significant increase in the scores of total KDQOL (r=0.131, P<0.042), PCS domains (r=0.195, P<0.002), and physical functioning (r=0.157, P<0.015), role limitation due to physical problems (r=0.182, P<0.005), and energy/fatigue (r=0.137, P<0.034) subscales. However, no significant relationship was observed between QOL and BUN and serum calcium levels. Nonetheless, increase in serum creatinine level led to a significant

increase in the symptoms subscale in KDCS domains (r=0.164, P<0.011), and increase in serum phosphorus level resulted in a significant increase in dialysis staff encouragement subscales in KDCS domain (r= 0.182, P<0.006). On the other hand, by increase in serum potassium level, a significant decrease was detected in physical functioning in PCS domain (r=-0.130, P<0.043) and cognitive functioning in KDCS domain (r=-0.185, P<0.004). Also, increase in weight gain between two dialysis sessions led to a significant reduction in dialysis staff encouragement subscale in KDCS domain (r=0.131, P<0.043).

Analysis of the treatment-related factors demonstrated a significant reverse relationship between the mean scores of work status and undergoing dialysis in the morning (P<0.007), dialysis staff encouragement and undergoing dialysis in the evening (P<0.008), and patient satisfaction and undergoing dialysis in various shifts (P<0.036). Moreover, the patients who underwent dialysis twice a week had significantly higher scores in the effect of kidney disease subscale compared to those who received the treatment three times a week (P<0.011). In addition, the patients who spent 30 minutes or less to reach the dialysis center obtained significantly higher scores In work status subscale(P<0.010). Also, the patients who underwent dialysis by high-flow filters gained significantly higher scores in physical function subscale (P<0.021).

Finally, according to the results of multivariate and linear regression analysis through backward method, after entering the demographic, physical, and treatment-related predicting factors with P<0.20 (gender, age, occupation, Charlson's comorbidity index and serum hemoglobin )into the model, female gender, unemployment and scores 3-4 and 5-7 of Charlson's comorbidity index were shown as the predictors of QOL (Table3).

## 4. DISCUSSION

In the present study, the mean score of QOL was approximately similar to result of Abbas-zadeh etal., study, in south of Iran (26), but was slightly different from results of Al-Jumaih et al. study, in Saudi Arabia(9).This difference might be due to the geographical, cultural, and lifestyle variations between two countries. This sample had higher score in "patient satisfaction" and "dialysis staff encouragement" subscales in KDCS domain, and" social functioning" subscale in MCS domain. These findings can be explained by the fact that in our society we have strong social support, family bonds, well-trained staff and well established dialysis centers. Proportionally, our patients scored high in "sexual function" subscale in KDCS domain. However this could be a misleading result and may not reflect the true status as this question was answered by only 56 patients (23.14%). The others were too embarrassed to respond to this question and this may have resulted in bias. Theresults shows that the lowest mean score of work status subscale in this study is similar to other published studies (9;10;25). A possible explanation for this finding is the fact that dialysis is a time-consuming procedure. Also, HD patient`s physical disabilities effect on their work capability or even being present at the work environment. Moreover, the scores of PCS in this study were lower than those of MCS and KDCS, which is consistent with the results of other studies (9, 15, 27). This finding can be attributed to the nature of the disease, its severe physical complications such as disequilibrium syndrome, cardiovascular disorders, and metabolic disorders, and experience of pain during vascular access in dialysis (28**).**

In the present study, female gender, aged ≥50 years, primary school education, unemployment, no support from HD patient association, without heading the household, living in rural areas, and no history of kidney transplantation were associated with lower scores in all the three domains of QOL. Other studies have also reported lower QOL in the women undergoing HD. For instance, Lopes etal. in their Dialysis Outcomes and Practical Patterns Study (DOPPS) indicated that women had obtained lower scores in physical functioning, bodily pain, fatigue/energy, and symptoms compared to men (15).Also, findings of Pakpour et al. and Mujais et al., study showed that women gained lower scores in all the three dimensions of QOL (25, 29).This might result from lower education levels and higher frequency of inactive lifestyle and obesity among women (30).

The findings of the present study demonstrated a significant reverse relationship between age and the three domains of QOL and physical functioning, general health perception, social functioning, energy/fatigue, symptoms, cognitive function, and sleep subscales. This finding is similar to Lessan -Pezeshkietal. study that in which samples aged above 50 years old significantly had lower scores in PCS, MCS, and KDCS domains compared to those aged below 50(16). This finding might be due to the specific changes which occur in all body organs by increase in age (31) which can intensify by CKD and HD and lead to more reduction in patients' QOL.

In addition, the patient with lower education levels obtained lower QOL scores in all domains and most of the subscales, which is in similar to some previous studies (15, 25, 32). The possible explanation is that lower educational level is

usually associated with lower income and, as a consequence, with lower HRQOL. Also, lack of knowledge about medical care, less capability in health reporting are all accompanied with lower education levels which result more hospitalizations and spending higher costs for health (33).

Corresponding to other studies (6, 15,16, 34), the study findings showed that total QOL, its domains, and most of its subscales were lower in the unemployed patients compared to other work statuses. This can be explained by considering the importance of having a work and earning an income for all individuals, particularly patients, for providing the treatment costs and maintaining one's independence. Also, financial difficulties due to unemployment may result in QOL deterioration (35).

Moreover, better scores in all domains and subscales, except for pain, general health perception, and dialysis staff encouragement, in this study, were seen in samples with higher incomes. Of course, this relationship was only significant in physical functioning and cognitive function subscales. Similar results were also obtained by Al-Jumaih et al., who disclosed that the patients with higher income levels gained significantly higher scores in PCS and MCS dimensions (9). It is obvious that physical and mental health is a prerequisite for finding a work and earning an income. Besides, higher income improves the patients' capability to afford the required treatments and ensure a better QOL.A secure income is a reassurance to the patients and contributes to their psychological wellbeing.

The present study findings revealed a significant direct association between the higher scores in physical functioning and sleep subscales; and also, PCS domains and the patient's coverage by insurance along with Association of Kidney Patients. This implies that the Association of Kidney Patients has managed to improve the patients' QOL by providing educational-financial support and follow-up programs.

Samples that were the head of their households had significantly higher scores in pain, general health perception, emotional well-being, symptoms, and effect of kidney disease subscales. Having the responsibility to other person and making important decisions in the family may motivate the persons to considering him/herself as a valuable, confident person and improving satisfaction feeling with life and higher QOL.

Furthermore, the patient who lived in urban areas obtained significantly higher scores in emotional well-being, energy/fatigue, and also burden of the disease, work status, and social support subscales. This is similar to Moist et al. study that was shown patients who traveled a longer distance to reach the dialysis center had lower QOL scores (36). This might result from needs of urban residents' to spend less time and costs to reach the dialysis center. In contrast, Diamant et al., showed no significant difference between the two groups of patients regarding SF-36 scores (37).

In the current study, the patients with two or more primary diseases, such as diabetes and kidney stone, obtained lower scores in most dimensions and subscales, however this finding was not statically significant, which is in agreement with the previous studies (9;25;32) that showed no significant relationship between primary cause of diseases and overall QOL.

There was nosignificant difference between mean scores of patients' QOL, it`s all domains and subscales and BMI, similar to Lopes et al study (15). In contrast, some studies have shown a decrease in QOL scores with increase in BMI (25, 37). Therefore, further researches should be performed on the relationship between BMI and QOL.

Like some other studies (6, 7), this results demonstrated no significant association between smoking and QOL. Although,some researchers believe that smokers normally had poorer QOL, compared to non-smokers (30). Additionally, in comparison to the patients who smoked less than 10 cigarettes a day, those who smoked at least 10 cigarettes a day had significantly higher scores in pain subscale. This finding can be explained by nicotine's inhibitory effect on pain (39). Although, the small number of smokers in this study is limited the exact analysis.

Significant relationship between history of kidney transplantation and mean scores of physical function and symptoms subscales and total QOL was surprising. However, Yang et al. reported a reverse relationship between history of kidney transplant rejection and QOL (6). Considering the small number of patients with history of transplant rejection (6.2%), this finding needs to be further investigated.

Regarding the physical factors, scores of Charlson's comorbidity index were significantly related to overall QOL score and its domains. This finding is consistent with other studies results (15,25,29,34,40,41). Suffering from several chronic diseases obviously puts the hemodialysis patients' physical and mental welfare at risk. Besides, more complex treatment plans, also their complications and costs can lead to change the patients' lifestyle and have negative effects on their QOL.

In this study, a significant direct association was observed between higher hemoglobin and hematocrit levels and subscales of physical functioning, role limitation due to physical problems, and energy/fatigue and also, PCS domain as well as between higher hemoglobin levels and symptoms subscale. Other researches also indicated an improvement in QOL after correction of anemia with erythropoietin in hemodialysis patients (42). Low level of blood hemoglobin may cause feeling of early fatigue, headache, shortness of breath, and sleep disorders (43) which can all affect QOL negatively.

Findings demonstrated a significant relationship between higher SBP in pre-dialysis time and lower score of sexual function subscale. Lopes et al. also reported a decrease in the patients' sexual function with increase in their SBP (15). Similarly, evidence has proved that sexual dysfunction was more frequent among hypertensive compared to those with normal blood pressure (44). DBP had no significant correlation with samples QOL.

The study revealed no significant association between QOL and BUN levels, which is similar to some studies (29; 32). Nonetheless, a significant direct relationship was detected between higher serum creatinine levels and symptoms subscale in KDCS dimension. Chiung et al., mentioned low serum creatinine levels as the predictor of low quality of life in physical and mental domains (12). Klersy et al., also reported that low serum creatinine levels resulted in lower MCS scores (45). However, some studies have shown no associations between serum creatinine levels and QOL (29,32,46). Thus, more researches are required to be conducted in this area. High serum phosphorus level was directly related to higher scores in dialysis staff encouragement subscale in KDCS domain. Nurses can detect high serum phosphorus levels in the patients plan special nutritional educational program. Thus, coping with problems and life satisfaction could be improved in HD patients. Moreover, serum level of potassium had a significant reverse relationship with physical and cognitive functioning subscales. This can be attributed to the effect of excessive potassium levels on the incidence of nausea, vomiting, muscular weakness, illness, and change in cardiac rhythm (43). Similarly, Yamana et al., study showed that serum potassium levels led to a significant reduction in the scores of mental health, social function, symptoms, and effect of kidney disease (47).

Significant direct correlation was observed between the score of dialysis staff encouragement subscale and weight gain between two dialysis sessions in this study. Routine weighting HD patients by nurses help detection of patient`s weight gain on time planning for support and encourage them to follow a proper diet, which eventually results in the patients' satisfaction with feeling of more support.

Findings demonstrated a significant reverse relationship between work status scores and dialysis time in the morning as well as dialysis staff encouragement and patient satisfaction with dialysis in variable shift among treatment-related factors. Interference of dialysis time in morning shifts on usual working hours of the society can effect on this result. Various dialysis shifts can change the life plans of the patients, particularly married patients and those with children, and cause dissatisfaction with dialysis and the treatment staff. Furthermore, Patients with twice a week dialysis plan had higher scores on QOL compared to those who with three time a week dialysis. This is obvious that less dialysis sessions need less transportation that result in more time to spend on their work and daily life and less dependence on dialysis and the treatment staff.

As previous studies (13, 9, 32), our findings showed no significant correlation between the years on dialysis and QOL, its domains and subscales. Yet, compared to the patients with the history of dialysis for less than 5 years, those with the history of dialysis for at least 5 years obtained lower scores in total QOL and its domains. Also, Anees et al., Pakpour et al., and Ginieri-Coccossis et al., reported that most of the patients who had undergone dialysis for a longer time period gained lower scores in physical status (8, 25, 48). Anees et al., write that patients, at the start of dialysis treatment, think that their kidney will recover very soon, but with passage of time, when they maintain their life on dialysis, their worries increase and impair QOL (8).

The results revealed a significant reverse relationship between spending more time to reach the dialysis center and work status subscale. This can be attributed to spending more time, energy, and cost, stress related to timely arrival at the dialysis center, and limitation in daily activities at least on the day of dialysis. Consistently, Moist et al. stated that spending more than 60 minutes, compared to 15 minutes, to reach the dialysis center led to lower QOL scores ($P<0.05$).Also, study results indicated that the patient dialysis with low-flow filters is associated with lower physical functioning scores in comparison to those with high-flow filters procedure. Evidence has also proved better clinical outcomes in the patients undergoing dialysis with high-flow filters (49;50). This could be attributed to removal of more urea which improves the patients' physical function.

The results of linear regression analysis through backward method showed that only gender, occupation, and Charlson's comorbidity index were the predictors of QOL. Gayle et al. also confirmed that lack of comorbidities and appropriate socio-economic status (including occupation and income) were the predictors of the patients' better QOL (40). Also, some studies have mentioned female gender (10, 32, 51) and Unemployment (15,40) as the predictors of low QOL.

## 5. CONCLUSION

According to the results of study, female gender, unemployment, and suffering from several diseases (high scores in Charlson's comorbidity index) were the predictors of poor QOL. Therefore, identification of these factors in designing care and treatment programs could help physicians and nurses to provide more appropriate services with lower costs and shortest period of time. Thus, more supportive care should be considered for female, unemployed, and weak patients in medical services provision, planning, and resources allocation in order to improve the patients' QOL.

## 6. LIMITATIONS AND SUGGESTIONS

The main limitation of this study was investigation of the predictors of QOL without taking the patients' nutrition status into account. Also, we have not measured adequacy of dialysis in these patients, therefore, there is a need to do a prospective study with considering this aspects in evaluating QOL related factors.

## 7. COMPLIANCE WITH ETHICAL STANDARDS

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Conflict of interest: all authors of this study declare that they have no conflict of interest.

Ethical approval: this article does not contain any studies with animals performed by any of the authors.

Informed consent: Informed consent was obtained from all patients included in this study.

**Table.1: Mean scores of KDQOL in each domain**

| Components of KDQOL-SF36 | Subscales | Mean and SD |
|---|---|---|
| Physical health component summary (PCS) | Physical functioning | 53.40±2.69 |
| | Role-physical | 42.74±4.04 |
| | Pain | 56.79±3.21 |
| | General health | 40.78±17.69 |
| | Total (PCS) | 46.99±1.94 |
| Mental health component summary (MCS) | emotional well being | 54.63±19.60 |
| | role emotional | 49.43±3.89 |
| | social functioning | 57.72±27.49 |
| | energy/fatigue | 41.22±20.08 |
| | Total(MCS) | 48.76±1.80 |
| Kidney disease component summary (KDCS) | symptom / problem | 74.29±16.69 |
| | effects of kidney disease | 44.40±2.00 |
| | effects of kidney disease without effect of sexual | 44.20±20.42 |
| | burden of kidney disease | 27.43±23.00 |
| | work status | 19.10±2.90 |
| | cognitive function | 74.52±20.84 |
| | quality of social interaction | 56.65±15.14 |
| | sexual function(n=56)* | 58.25±31.55 |
| | sleep | 61.98±22.94 |

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| | | |
|---|---|---|
| | social support | 76.55±22.26 |
| | dialysis staff encouragement | 70.22±21.20 |
| | patient satisfaction | 80.29±20.20 |
| | Total(KDCS) | 58.41±1.03 |
| KDQoL-SF36 (Total QOL) | | 54.00±13.33 |

* Only56 patients answeredsexual questions. So the impact of kidney disease listed in two parts: considering and regardless of sexual function.

**Table 2: KDQOL-SF scales scores by selected patient demographic, physical and treatment-related factors**

| factors | levels | PCS | | MCS | | KDCS | | Total QOL | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean and SD | p | Mean and SD | p | Mean and SD | p | Mean and SD | p |
| Age(years) | ≤50 | 52.94±18.41 | 0.0001 | 52.45±18.05 | 0.014 | 60.57±11.71 | 0.012 | 57.41±13.39 | 0.002 |
| | >50 | 42.44±19.25 | | 46.55±17.68 | | 57.13±9.16 | | 51.97±12.92 | |
| gender | Male | 49.53±19.87 | 0.005 | 51.78±18.56 | 0.0001 | 59.82±10.48 | 0.003 | 56.11±13.82 | 0.0001 |
| | Female | 42.50±17.72 | | 42.90±15.39 | | 55.68±8.56 | | 49.92±11.35 | |
| Marital status | Single | 50.65±18.34 | 0.392 | 50.63±15.81 | 0.192 | 59.12±12.46 | 0.273 | 55.46±12.91 | 0.228 |
| | Married | 46.89±19.81 | | 49.31±18.24 | | 58.74±10.12 | | 54.36±13.49 | |
| | Widowed | 43.61±18.15 | | 42.94±18.27 | | 55.42±8.60 | | 49.96±12.39 | |
| Occupational status | Unemployed | 41.50±19.83 | 0.003 | 43.99±18.46 | 0.001 | 55.81±8.72 | 0.0001 | 50.59±11.76 | 0.0001 |
| | Employed | 51.81±18.59 | | 52.30±15.82 | | 61.80±11.65 | | 50.59±11.76 | |
| | Retired | 52.00±20.82 | | 55.48±20.14 | | 61.39±10.75 | | 58.46±14.92 | |
| | Homemaker, disabled | 45.42±16.04 | | 45.79±14.72 | | 41.27±14.06 | | 52.32±9.74 | |
| Living place | urban areas | 49.43±18.12 | 0.13 | 51.86±17.69 | 0.037 | 60.03±9.72 | 0.058 | 56.23±12.30 | 0.043 |
| | Around town | 45.51±20.14 | | 46.87±18.01 | | 57.43±10.54 | | 52.65±13.79 | |
| BMI | Under weight | 40.65±20.28 | 0.183 | 46.05±18.92 | 0.690 | 56.32±10.53 | 0.201 | 50.83±13.88 | 0.267 |
| | Optimal weight | 47.41±19.40 | | 49.36±17.53 | | 58.52±10.45 | | 54.21±13.34 | |
| | Over weight | 50.06±18.03 | | 49.73±17.00 | | 60.17±10.24 | | 56.00±13.16 | |
| | Obese | 42.90±21.16 | | 46.08±17.82 | | 55.91±9.45 | | 51.12±13.17 | |
| Charlson's comorbidity index scores | 0 | 54.49±18.63 | 0.0001 | 54.04±18.83 | 0.0001 | 61.37±12.90 | 0.003 | 58.46±14.37 | 0.0001 |
| | 2-1 | 53.02±20.22 | | 52.80±18.42 | | 60.27±10.22 | | 57.62±13.74 | |
| | 4-3 | 40.81±17.83 | | 43.08±17.59 | | 56.75±8.30 | | 50.36±11.55 | |
| | 7-5 | 39.46±16.97 | | 44.40±13.43 | | 54.45±8.38 | | 48.76±10.91 | |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | >8 | 42.00±22.63 | | 62.48±12.36 | | 62.13±9.57 | | 58.40±13.68 | |
| Years on dialysis | <5 | 47.46±19.01 | 0.341 | 48.82±18.37 | 0.920 | 58.67±10.16 | 0.474 | 54.30±13.28 | 0.517 |
| | ≥5 | 44.79±20.93 | | 48.54±16.90 | | 57.54±10.81 | | 52.97±13.57 | |
| type of dialysis filter | Low- flow | 45.13±17.96 | 0.093 | 46.87±16.59 | 0.064 | 52.62±11.58 | 0.052 | 52.62±11.58 | 0.078 |
| | High -flow | 49.39±21.08 | | 51.20±19.52 | | 59.40±12.05 | | 55.78±15.18 | |

**Table 3: multivariate and linear regression analysis, QOL predictors**

| | Demographic, Physical and treatment-related predictors | | regression coefficient | standard error | Confidence interval 95% | | t-test | significance level |
|---|---|---|---|---|---|---|---|---|
| | | | | | Minimum | Maximum | | |
| Entered variables in to the model | Gender | Female | Reference | | | | | |
| | | Male | 7.42 | 2.47 | 2.55 | 12.29 | 3.00 | 0.003 |
| | Age(years) | ≤50 | Reference | | | | | |
| | | >50 | -0.022 | 2.44 | -4.83 | 4.78 | -0.009 | 0.933 |
| | Employed versus unemployed(as reference) | | 6.31 | 2.10 | 2.18 | 10.45 | 3.00 | 0.003 |
| | Retired versus unemployed | | 8.93 | 2.27 | 4.45 | 13.42 | 3.92 | 0.0001 |
| | Homemaker, disabled versus unemployed(as reference) | | 9.78 | 2.90 | 4.06 | 15.50 | 3.37 | 0.001 |
| | Charlson's comorbidity index 3-4 scores versus 0 score(as reference) | | -5.95 | 2.42 | -10.72 | -1.17 | -2.45 | 0.015 |
| | Charlson's comorbidity index 5-7 scores versus 0 score(as reference) | | 7.86 | 2.73 | -13.24 | -2.48 | -2.78 | 0.004 |
| | Hemoglobin( mg/dl) | | 0.679 | 0.416 | -0.141 | 1.49 | 1.63 | 0.104 |
| The remaining variables in the final model | gender | Female | Reference | | | | | |
| | | Male | 7.46 | 2.46 | 2.60 | 12.31 | 3.02 | 0.003 |
| | Employed versus unemployed(as reference) | | 6.38 | 2.09 | 2.25 | 10.51 | 3.04 | 0.003 |
| | Retired versus unemployed | | 9.46 | 2.16 | 5.19 | 13.73 | 4.36 | 0.0001 |
| | Homemaker, disabled versus unemployed(as reference) | | 10.06 | 2.90 | 4.35 | 15.78 | 3.47 | 0.001 |
| | Charlson's comorbidity index 3-4 scores versus 0 score(as reference) | | -6.25 | 1.88 | -9.96 | -2.54 | -3.32 | 0.001 |
| | Charlson's comorbidity index 5-7 scores versus 0 score(as reference) | | -8.26 | 2.15 | -12.52 | -4.01 | -3.82 | 0.0001 |

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