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Measures and Determinants of Health Related Quality of Life (HRQOL) in Hemodialysis Patients - A Review

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Abstract

Measuring health related quality of life in chronic disease patients is a valuable research tool in assessing the outcome of therapeutic intervention in chronic diseases.End stage renal disease is one such chronic disease causing a high level of disability in different domains of the patients' life leading to impaired quality of life. Several sociodemographic and treatment related factors known to influence health related quality of life. In this study we have systematically reviewed thehealth related quality studies of end stage renal disease patients undergoing hemodialysis patients to identify the different measures and determinants of health related quality of life. Studies assessing health related quality of life of hemodialysis patients have identified different factors influencing health related quality of life like sociodemographic factors (i.e., age, gender, education, employment, family income, ethnicity, race) and disease and treatment related factors (i.e., co-morbidities, duration of dialysis, type of dialysis, hemoglobin, serum albumin level and erythropoietin treatment. Factors influencing health related quality of life known to vary among studies. This difference could be due to the difference in the study design, duration of follow-up, type of instrument used to measure health related quality of life, sample size and may be due to lack of homogeneity of the group of patients compared.

Key Words*: Hemodialysis, Quality of Life, Health Related Quality of Life, End Stage Renal Disease.*

Introduction

Over the past few decades quality of life (QOL) [1] research endpoints have emerged as valuable research tools in assessing the outcome of therapeutic interventions in chronic diseases. [2] The greatest interest is in measuring health related quality of life (HRQOL) in chronic disease patients. [3] End stage renal disease (ESRD) is one such chronic disease causing a high level of disability in different domains of the patients' life leading to impaired quality of life. [4]

In last two decades, research has focused on evaluating health related quality of life of ESRD patients as an outcome measure of different treatment modalities. Majority of these studies were focused on evaluating HRQOL of ESRD patients treated by different renal replacement therapies such as hemodialysis, [5,6] peritoneal dialysis, [7] and renal transplantation. [8, 9] Also some of these studies compared HRQOL in patients receiving different renal replacement therapies, [10, 11] erythropoietin for anemia, [12, 13] dialysis adequacy on HRQOL of ESRD patients. [14] Importance was also given to assess the impact of HRQOL on morbidity and mortality, [15] identifying the predictors of HRQOL, [16, 17] changes in the HRQOL over a period of time [18] and comparing HRQOL in ESRD with healthy general population [19-21] or with other chronic diseases. [22]

Worldwide, the incidence of end stage renal disease is increasing [23] Even in India the incidence rate of ESRD is fast assuming in alarming proportions. [24] It is estimated that 100,000 patients develop ESRD each year in

developing countries. [25] Most of the studies conducted and published to assess the QOL, in particular HRQOL, in ESRD patients are from developed countries. [5-21] In India, the concept of quality of life and quality adjusted life years in chronic diseases is an emerging concept. There are very few studies published addressing this topic, especially in ESRD. [26]

Measuring the Health Related Quality of Life

Various methodological approaches have been mentioned in the scientific literature to measure the HRQOL. But there are nogold standard methods to measure HRQOL.HRQOL measurements comprise of both objective and subjective well-being measurements. [1]

Objective well-being measures comprise of variables that can be assessed in terms of quantity or frequency such as number of times the patients were admitted to the hospital, the distance a patient can walk or the ability to climb the stairs. These measures also include indicators such as employment status, income, contact with relatives and friends and standard of housing etc. The subjective well-being measurements are those measures, which cannot be assessed accurately by anyone other than the patient himself or herself, such as level of pain or distress, level of satisfaction with their daily activities, leisure time, the medical care they receive or overall life. [1]

Generally HRQOL of the people cannot be measured directly, and it is often measured indirectly by asking a set of questions to a patient by an observer, concerning the disease and nature of treatment. There are a wide variety of instruments available to evaluate the HRQOL of the patients in general. These instruments can be categorized into two types:

1. Generic instruments
2. Disease specific instruments

Generic instruments measure the health status and well-beingi of all persons irrespective of the personal characteristics, whether the person is healthy or affected by a disease. [27-29] Disease specific HRQOL instruments are those set of instruments, which are specially designed to assess the impact of a specific disease on HRQOL. These instruments consist of disease specific dimensions or domains. [27-30]

Health related quality of life instruments used in ESRD

As quality of life is a very complex concept that has not been well defined a great number of measurement instruments have been developed. Both generic and disease specific instruments were used to measure HRQOL in dialysis patients. Some of the studies have used only generic questionnaires such as Spitzer Quality of life index; [4] Karnofsky scale and sickness impact profile; [31,32] Health measurement questionnaire; [33] Quality of life assessment battery; [34] EUROQOL; [35,36] RAND-36; [37] Choice Health Experience Questionnaire, [38] WHOQOL-BREF and MOS SF-36. [39, 40] The SF –36 was the most commonly used generic questionnaire.[41-44] Disease specific instrument such as KDQOL-SF was used in majority of the quality of life studies in ESRD patients. [45-47] Some researchers have also used kidney disease questionnaire (KDQ) [48] and Chinese dialysis QOL scale. [49] There is a trend to use both generic and specific instruments in recent studies. [50] Examples of the kidney disease specific questionnaires with its strengths and limitations are presented in Table 1.

Determinants of health related quality of life in dialysis patients

There are several longitudinal and cross sectional studies, which identified the determinants or factors influencing quality of life of dialysis subjects. Demographic variables and disease/treatment conditions that influence the HRQOL of dialysis patients have been investigated in several such studies. Literature search using computer

databases such as Medline, Pubmed, IOWA drug information service, IPA abstracts retrieved several research articles, which deal with the assessment of HRQOL in dialysis patients.

Both longitudinal and cross sectional studies were included for the review. Only those research papers, which were in English and published in full length, were considered for the review. Research studies addressing exclusively on HRQOL of peritoneal dialysis, renal transplantation or any other renal replacement therapies apart from hemodialysis were excluded from the review. Research papers published before December 2006 were considered for the review. Only one reviewer (SBS) was involved in the screening of research articles. The key words used to search included quality of life, health related quality of life, hemodialysis, end stage renal disease, chronic renal failure and renal replacement therapies.

Gender and health related quality of life

Studies determining gender association with quality of life have reported inconsistent results. Female dialysis subjects demonstrated a poor HRQOL in several or all dimensions of Quality of life. [40, 43, 45, 51, 52, 53] Few cross sectional studies demonstrated lower HRQOL in male dialysis subjects, [54, 55] while another study demonstrated a better HRQOL in sexual function dimension in black women undergoing hemodialysis thanmen. In few studies, no significant difference between the HRQOL of male and female hemodialysis subjects was observed. [19, 56, 57]

Age and health relatedquality of life

The consequence of age on HRQOL is controversial. Several studies reported a lower HRQOL in elderly renal disease patients in some dimensions of HRQOL. [58, 16, 54, 59-62] While another study indicated a lower HRQOL in pediatric renal disease patients in physical activity dimension than older age groups. [63] One more study, observed a lower psychological HRQOL scores in younger age group patients with renal disease. [64]Age was negatively associated with physical components of HRQOL in Turkish hemodialysis patients. [65] However, two studies documented no significant difference in HRQOL of younger and older age group renal disease patients. [57, 66]

Type of co-morbidity and health related quality of life

Comorbidity was inversely related to HRQOL. [67, 31, 43, 60, 62] Diabetes as a comorbid condition had negative effects on HRQOL. [52, 59, 61, 62, 68] One cross-sectional study indicated lower physiological function HRQOL scores in dialysis patients with musculo-skeletal disorder as comorbidity. [58] While another cross-sectional study did not find any considerable difference in the QOL scores of hemodialysis subjects with or without diabetes. [57]

Education status and health related quality of life

There were five studies, which assessed the influence of education status on HRQOL of hemodialysis patients. [40, 43, 53, 57, 69] Higher educational status had a positive correlation with HRQOL in four studies,[40, 43, 53, 69]Whileone study did not find any association. [57]

Marital status and health related quality of life

Three cross-sectional studies evaluating the association of marital status on HRQOL indicated dissimilar observations. [57, 66, 70] One of these studies documented a better HRQOL scores in unmarried group, [70] while the investigators of the other two studies did not find any significant impact of marital status on HRQOL. [57, 66]

Employment status and health related quality of life

There were seven cross-sectional studies, which evaluated the impact of employment status on HRQOL. Employed or vocationally active subjects reported a better quality of life in some dimensions (bodily pain, general health,

psychological, physical function, role physical, social dimensions and vitality and role emotional scales) in six studies. [58, 43, 47, 54, 71, 72] While one study did not find any significant association. [57]

Income and health related quality of life

Few studies evaluated the influence of income or salary to the HRQOL of dialysis subjects. In three cross-sectional studies the quality of life was found to be poorer among lower income group. [66, 69, 73]

Duration of maintained hemodialysis and health related quality of life

Duration of maintained dialysis also may influence HRQOL of dialysis patients. Two cross-sectional design studies compared HRQOL of patients at different duration of maintained dialysis. [74, 75] A positive correlation was observed between duration of dialysis and physical component scores of the dialysis patients. [74] While another cross-sectional study did not find any relationship between treatment duration and HRQOL. [75]

Ethnicity, race and health related quality of life

Few studies have also assessed the influence of ethnicity and race on HRQOL. A study comparing the HRQOL among dialysis patients in Seattle in Washington and Aichi in Japan, revealed lower physical QOL in Seattle patients, while mental HRQOL of Seattle patients were higher than the Aichi patients. [76]A cross-sectional study comparing the HRQOL data of the three continents (United States, Europe and Japan) indicated that patients of United States reported higher mental health and mental component summary HRQOL scores than patients of other two continents. While Japanese patients reported higher burden of kidney disease than patients of United States and Europe, but better physical functioning HRQOL scores than patients of United States and Europe. The generic HRQOL scores of patients of all the three continents were much lower than the general population of their respective continent.[21]

In a cross-sectional study, black men receiving dialysis reported better QOL than white people in some dimensions of KDQOL-SF. In another study African-Americans reported significantly higher HRQOL in psychological well-being and lower burden of kidney disease than non-African-Americans. [19] In another prospective cohort study lower physical functioning in both black and white women was observed. While black women maintained on hemodialysis had considerably higher sexual function than comparable groups. [41] In another study, HRQOL was significantly lower in Indo-Asians (Indians settled in UK) than white Europeans for physical health, mental health and kidney disease targeted issues. [77] There is one study, which indicated fairly high and similar HRQOL in black and whites.[64]

Erythropoietin therapy and health related quality of life

There are several longitudinal, cross-sectional and randomised studies on the impact of erythropoietin treatment on HRQOL of dialysis patients.[78-80]A randomised double-masked placebo-controlled trial indicated a considerable improvement in the HRQOL of the patients who received erythropoietin treatment. The study has showed that there was a significant improvement in the fatigue and physical symptom dimensions. [48] In another randomised, parallel-group, open label clinical trial, erythropoietin treatment group reported a significant improvement in the energy, physical function, home management, social function and cognitive function.[79, 80]

Daily and nocturnal dialysis and health related quality of life

Few studies have indicated the significance of daily and nocturnal dialysis in improving the HRQOL of ESRD patients. [81-84] These studies have reported improved HRQOL in short-term daily hemodialysis subjects compared to controls on conventional dialysis. Some or all measures of HRQOL such as increased sleep, general health, vitality, mental health, energy, physical composite scores, mental composite scores, cognitive function symptoms, effects of kidney disease, energy fatigue, physical and emotional healthand social interaction, was found to be improved. [81-84] One cross-sectional study assessed the HRQOL of dialysis subjects at the initiation of maintenance hemodialysis. The role limitation is reported to be significantly impaired in dialysis subjects. [85]

Sexual function and health related quality of life

Few research studies have analyzed the influence of sexual function on HRQOL of dialysis patients.[86] The results of one study indicated that 47% of the patients initiated dialysis reported having no sexual activity at all. Subjects who have reported sexual activity had better physical performance, better health status and lower difficulty in doing daily activities and pain.[87] Another comparative study indicated significantly more sexual dysfunction in female dialysis subjects than comparable healthy women. [88] Decreased HRQOL (lower mental composite score, poorer social interaction, decreased emotional well-being, poorer social function) has been reported in patients with sexual/erectile dysfunction. [89, 90]

Sleep pattern and health related quality of life

Dialysis subjects commonly report sleep complaints and some studies have examined the influence of sleep on HRQOL in these subjects. Many of these studies indicate the negative impact of the poor sleep on quality of life dimensions (physical, mental, vitality, bodily pain). [44, 91, 92] One study examined the impact of restless leg syndrome, insomnia on HRQOL of dialysis subjects. The study has showed that patients with restless leg syndrome have poor sleep and thus reduced HRQOL along most of the general and kidney disease-specific domains of the questionnaire. [92]

Depression and health related quality of life

Depression has been found to be the most common psychiatric disturbance in patients on dialysis, with as many as 20% to 30% of patients on renal replacement therapy suffering from depression and is found to have negative impact on HRQOL. [93,94] One study examining the association between depression and laboratory parameters of hemodialysis patients revealed a relationship between higher depression score, low level of hemoglobin, albumin level and low SF-36 score.[93] In another study depression was negatively correlated with psychological well-being and QOL of diabetic hemodialysis patients. [95]

Pruritus, Itching and health related quality of life

Pruritus and itching are common and disturbing physical symptoms among patients receiving hemodialysis. Moderate to extreme pruritus and itch are adversely known to impact several aspects of HRQOL (physical, mental) of hemodialysis patients. [96, 97]

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Table 1: Examples of the kidney disease specific questionnaires

ESRD-Targeted instruments	Dimensions	Administration	Reliability &validity	Strengths	Limitations
The Kidney Disease Questionnaire (KDQ) [76]	Consists of 26 questions in five dimensions such as; physical symptoms, fatigue, depression, relationship with others and frustration.	Self-administered questionnaire.	Good reliability and Construct validity	Good responsiveness, and it can be administered in 10-15minutes.	It can be administered only to hemodialysis patients and it does not contain item enquiring overall health of patients.
HRQOL instrument developed by Parfrey et al. [77]	Consists of Campbell's indices, KPS and Spitzer quality of life Index.	Interviewer-administered questionnaire	Good face and construct validity	Good reproducibility, responsiveness, Short administration time (15 to 20minutes)	A well-trained interviewer is required to administer the questionnaire.
End Stage Renal Disease Severity Index (ESRD-SI) [48]	Consists of items related to physical and psychosocial dimensions .	Self-administered questionnaire	Adequate inter-rater reliability, test-retest reliability and construct validity	Sensitive indicator of disease severity.	Assess mainly disease severity than QOL
Kidney Disease Quality of Life Questionnaire (KDQOL)[73]	Consists SF-36 as generic along with 43 ESRD specific items such as symptoms/problems, effects of kidney disease on life, burden of kidney disease, cognitive function, work status, sexual life, quality of social interaction and sleep.	Self or interviewer administered.	Very good reliability and validity	Easy to administer, contains both generic and disease specific items.	It takes around 30minutes to complete the questionnaire.
Kidney Transplant Questionnaire (KTQ) [74]	Consist of dimensions such as physical symptoms, appearance, fatigue, emotions, uncertainty and fear.	Self-administered	Good validity and reliability.	Specific to transplant patients.	Cannot be used in patients receiving other renal replacement therapies such as dialysis. Hence cross comparisons is not possible.
The CHOICE Health Experience Questionnaires (CHEQ) [4]	Consists of 21 domains and 83 items	Self-administered	Adequate internal consistency and construct validity	Covers majority ESRD-specific domains.	Responsiveness of the instrument is not established.

Hemoglobin or hematocrit level and health related quality of life

There are several longitudinal and prospective studies, which assessed the relationship of hemoglobin or hematocrit level with HRQOL. [31, 44, 97-100] Majority of these studies documented a positive correlation between subjects' hemoglobin level and their perceived HRQOL. [31, 44, 97-100] Lower HRQOL is documented in one or several dimensions of HRQOL. While one study observed no significant differences between hematocrit level and HRQOL.[56]

Serum albumin level and health related quality of life

Serum albumin level may also influence the HRQOL of dialysis patients. Majority of the cross sectional studies indicated a positive association between serum albumin level and some of HRQOL of dimensions (physical, role physical, vitality, social functioning, role emotional and mental health). [52, 56, 98]

Conclusion

In conclusion, our review on different measures of QOL of hemodialysis patients identified the different types of generic and disease specific instruments being used to evaluate QOL of hemodialysis patients. Among these SF-36 and KDQOL are the most validated and commonly used generic and disease specific questionnaires respectively. There is substantial amount of literature is available concerning the determinants of quality of life in hemodialysis patients. Our reviews of quality of life studies have identified many such variables influencing the QOL of hemodialysis patients.

References:

1. Testa M.A., Simonson DC.. Assessment of quality-of-life outcomes. N. Engl. J. Med.1996; 334: 835-40.
2. Kaufman S.E.. The increasing importance of quality of life research. Clin. Res. 2001; 1:18-22.
3. Edgell E.T., Coons S.J., Carter W.B., Kallich J.D., Mapes D., Damush T.M., *et al*. A review of Health-Related quality-of-life measures used in end stage renal disease. Clin.Ther.1996; 18: 887-38.
4. Fox E., Peace K., Neale T.J., Morrison R.B.I., Hatfield P.J., and Mellsop G.. "Quality of Life" for patients with end stage renal failure. Ren. Fail. 1991; 13: 31-35.
5. Carmichael P., Popoola J., John I., Stevens P.E., Carmichael A.R.. Assessment of quality of life in a single centre dialysis population using the KDQOL-SF questionnaire. Qual. Life Res. 2000; 9:195–205.
6. Evans R.W., Manninen D.L., Garrison L.P., Hart L.G., Blagg C.R., Gutman R.A., *et al*. The quality of life of patients with end-stage renal disease. N. Engl. J. Med. 1985; 312: 553-59.
7. Sanjeev KM., Ahern L., Flaster E., Mittal V.S., Maesaka J.K., FishbaneS.. Self-Assessed Quality of Life in Peritoneal Dialysis Patients. Am. J. Nephrol. 2001; 21:215-20.
8. Fiebiger W., Mitterbauer C., OberbauerR.. Health related quality of life outcomes after kidney transplantation Health Qual. Life Outcomes. 2004; 2: 2.
9. Overbeck I., Bartels M., Decker O., Harms J., Hauss J., and FangmannJ.. Changes in Quality of Life After Renal Transplantation. Transplant Proc.2005;37: 1618–21.
10. Wasserfallen JB., Halabi G., Saudan P., Perneger T., Feldman H.I., Martin P.Y., *et al.*Quality of life on chronic dialysis: comparison between hemodialysis and peritoneal dialysis. Nephrol. Dial. Transplant. 2004; 19:1594-99.

11. Wu A.W., Fink N.E., Marsh-Manzi J.V.R., Meyer K.B., Finkelstein F.O., Chapman M., *et al*. Changes in Quality of Life during Hemodialysis and Peritoneal Dialysis Treatment: Generic and Disease Specific Measures. J. Am. Soc. Nephrol. 2004; 15:743-53.
12. Beusterien K.M., Nissenson A.R., Port F.K., Kelly M., Steinwald B., and Ware J.E..The effects of Recombinant Human Erythropoietin on functional health and well-being in chronic hemodialysis patients. J. Am. Soc. Nephrol. 1996; 7:763-73.
13. Revicki D.A., Brown R.E., Feny D.H., Henry D., Teehan B.P., Rudnick MR.. Health- related quality of life associated with recombinant human erythropoietin therapy for predialysis chronic renal disease patients.Am. J. Kidney Dis.1995; 25:548 -54.
14. Chen Y.C., Hung K.Y., Kao T.W., Tsai T.J., and Chen W.Y..Relationship between dialysis adequacy and quality of life in long-term peritoneal dialysis patients. Perit. Dial. Int. 2000; 20:534-40.
15. Mapes D., Lopes A.A., Satayathum S., McCullough K., Goodkin D., Locatelli F., Fukuhara S., Young E., Kurokawa K., Saito A., Bommer J., Wolfe RA., Held P., Port F.. Health-related quality of life as a predictor of mortality and hospitalization: the Dialysis Outcomes and Practice Patterns Study (DOPPS). Kidney Int. 2003; 64:339-49.
16. Christensen AJ.,Wiebe JS., Smith TW., Turner CW.. Predictors of Survival among Hemodialysis Patients: Effect of Perceived Family Support. Health Psychol.1994; 13: 521-25.
17. McClellan W.M., Anson C., Birkeli K., Tuttle E.. Functional Status and Quality of Life: Predictors of Early Mortality Among Patients Entering Treatment for End Stage Renal Disease. J.Clin. Epidemiol. 1991; 44:83-9.
18. Merkus M.P., Jager K.J., Dekker F.W., de Haan RJ., Boeschoten EW., Krediet RT..Quality of Life Over Time in Dialysis: The Netherlands Cooperative Study on the Adequacy of Dialysis. Kidney Int. 1999; 56:720–.28
19. Unruh M., Miskulin D., Yan G., Hays R.D., Benz R., Kusek J.W., Meyer KB.. Racial differences in health-related quality of life among hemodialysis patients. Nephron. Clin.Pract. 2004:96:21-7.
20. Rebollo P., Ortega F., Baltar J.M., Alvarez-Ude F., Alvarez Navascues R., Alvarez-Grande.. Is the loss of health-related quality of life during renal replacement therapy lower in elderly patients than in younger patients? Nephrol. Dial. Transplant. 2001:16:1675-80.
21. Fukuhara S., Lopes A.A., Bragg-Gresham J.L., Kurokawa K., Mapes D.L., Akizawa..Health-related quality of life among dialysis patients on three continents: The Dialysis Outcomes and Practice Patterns Study. Kidney Int. 2003:64: 1903-10.
22. Laborde J.M., Powers M.J.. Satisfaction with life for patients undergoing hemodialysis and patients undergoing hemodialysis and patients suffering from osteoarthritis. Res.Nurs. Health. 1980; 3:19-24.
23. Zillich A.J., Saseen J.J., DeHart R.M., Dumo P., Grabe D.W., GilmartinC..*et al*. Caring for patients with chronic disease: A joint opinion of the ambulatory care and the Nephrology care and Practice and Research networks of the American college of clinical Pharmacy. Pharmacotherapy. 2005; 25:123-43.
24. Sakhuja.,Jha., Ghos., Ahmed.. Chronic renal failure in India. Nephrol. Dial. Treatment. 1994; 9: 871-72.
25. Vijay K.. End-stage renal disease in developing countries. Kidney Int. 2002; 62: 350-62.
26. Udaya Kumar T.R., Amalraj A., Soundarajan P., Abraham G.. Level of stress and coping abilities in patients on chronic hemodialysis and peritoneal dialysis. Indian J Nephrol 2003; 13: 89-91.

27. Coons SJ.. Health outcomes and Quality of life. In: Dipiro J.T., Talbert R.L., Yee G.C., Matzke G.R., Wells B.G., Posey L.M., editors. Pharmacotherapy. A Pathophysiologic approach. 6thed. New York: McGraw-HILL; 2005.p.17.
28. Hays R.D.. Generic versus disease targeted instruments. In: Fayers P., Hays R., editors. Assessing quality of life in clinical trials. 2nd ed. Oxford: Oxford Press; 2005.p.3.
29. The EuroQol group—EuroQol—a new facility for the measurement of health-related quality of life. Health Policy.1990; l6: 199-208.
30. Fries J.F., Spitz P., Kraines G., Holman H.. Measurement of Patient Outcome in Arthritis. Arthritis Rheum. 1980, 23:137-45.
31. Moreno F., Gomez J.M.L., Guajardo S.D., Jofre R., ValderrabanoF.. Quality of life in dialysis patients. A Spanish multicenter study. Nephrol. Dial. Transplant. 1996; 11: 125-29.
32. Fitts S.S., Guthrie M.R., BlaggC.R.. Exercise Coaching and Rehabilitation Counseling Improve Quality of Life for Predialysis and Dialysis Patients. Nephron. 1999; 82:115-21.
33. GudexC.M.. Health-related quality of life in end stage renal failure. Qual. Life Res. 1995; 4:359-66.
34. Tucker C.M., Ziller R.C., Smith W.R., Mars D.R., Coons M.P.. Quality of Life of Patients on In-Center Hemodialysis Versus Continuous Ambulatory Peritoneal Dialysis. Perit. Dial. Int. 1992; 11:341-46.
35. Korevaar J.C., Jansen M.A., Merkus M.P., Dekker F.W., Boeschoten E.I., Krediet R.T., for The NECOSAD Study Group.. Quality of life in predialysis end-stage renal disease patients at the initiation of dialysis therapy. Perit. Dial. Int. 2000; 20: 69-75.
36. Wasserfallen J.B., Halabi G., Saudan P., Perneger T., Feldman HI., Martin PY., Jean-Pierre W.. Quality of life on chronic dialysis: comparison between hemodialysis and peritoneal dialysis. Nephrol. Dial. Transplant. 2004; 19: 1594–99.
37. Groothoff JW., Grootenhuis MA., Offringa M., Gruppen MP., Korevaar JC., Heymans HSA..Quality of life in adults with end-stage renal disease since childhood is only partially impaired. Nephrol. Dial. Transplant. 2003; 18: 310-17.
38. Wu A.W., Fink N.E., Cagney K.A., Bass E.B., Rubin H.R., Meyer K.B.,*et al*.Developing a health-related quality of life measure for end stage renal disease: The choice health experience questionnaire. Am. J. Kidney. Dis. 2001; 37:11-21.
39. NIU S.F., LI I.C., Quality of life of patients having renal replacement therapy. J.Adv.Nurs. 2005; 51:15–21.
40. Coelho-Marques F .Z. , Wagner MB., Figueiredo CEP., Avila DO.. Quality of life and sexuality in chronic dialysis female patients. Int. J.Impot. Res. 2006; 18:539–43.
41. Kutner N.G., Zhang R., Brogan D.. Race, Gender, and Incident Dialysis Patients' Reported Health Status and Quality of Life. J. Am. Soc.Nephro. 2005;16: 1440-48.
42. Meyer K.B., Espindle D.M., DeGiacomo J.M..Monitoring dialysis patients' health status. Am. J. kidney Dis. 1994; 24: 267-69.
43. Chiang C.K., Peng Y.S., Chiang S.S., He Y.H., Hung K.Y.. Health related quality of life of hemodialysis patients in Taiwan a multicenter study. Blood Purif. 2004; 22:490-98.
44. Illiescu E.A., Coo H., McMurray M.H., Meers C.L., Quinn M.M., Singer M.A., *et al*. Quality of sleep and health-related quality of life in hemodialysis patients. Nephrol. Dial. Transplant. 2003; 18:126–32.

45. Gil Cunqueiro J.M., Garcia Cortes M.J., Foronda J., Borrego J.F., Sanchez Perales M.C., Perez del Barrio P., *et al*. Health-related quality of life in elderly patients in hemodialysis. Nefrologia. 2003; 23:528-37.
46. Harris S.A., Lamping D.L., Brown E.A., ConstantinoviciN.. Clinical outcomes and quality of life in elderly patients on peritoneal dialysis versus hemodialysis. Perit. Dial. Int. 2002; 22:463-70.
47. Chow K.M., Szeto C.C., Kum L.C., Kwan B.C., Fung T.M., Wong T.Y., Leung C.B, Li P.K.. Improved health-related quality of life and left ventricular hypertrophy among dialysis patients treated with parathyroidectomy. J. Nephrol. 2003; 16:878-85.
48. Laupacis A., Wong C., Churchill D.,The use of generic and specific quality-of-life measures in hemodialysis patients treated with erythropoietin. Control. Clin. Trials. 1991:12; 168S-79S.
49. Craven J., Littlefield C., Rodin G., Murray M.. The End stage renal disease severity Index (ESRD-SI). Psychol. Med. 1991; 21:237-43.
50. Roderick P., Nicholson T., Armitage A., Mehta R., Mullee M., Gerard K.. An evaluation of the costs, effectiveness and quality of renal replacement therapy provision in renal satellite units in England and Wales. Health Technol. Assess. 2005; 9:1-178.
51. Vazquez I., Valderrabano F., Fort I., Jofre R., Lopez-Gomez J.M., Moreno F., Sanz- Guajardo D.. Differences in health-related quality of life between male and female hemodialysis patients. Nefrologia. 2004; 24:167-78.
52. MingardiG.. "From the development to the clinical application of a questionnaire on the quality of life in dialysis, the experience of the Italian collaborative DIA-QOL (Dialysis- Quality of life) Group. Nephrol. Dial. Transplant.1998; 13: 70-5.
53. Martinez-Castelao A., Gorriz JL., Garcia-Lopez F., Lopez-Revuelta., De Alvaro F., Cruzado JM., Spanish CALVIDIA Study Group.. Perceived health-related quality of life and comorbidity in diabetic patients starting dialysis (CALVIDIA study). J. Nephrol. 2004; 17:544-51.
54. Wolcott D.L., Nissenson A.R., and Lansverk J., Quality of life in chronic dialysis patients: Factors unrelated to dialysis modality. Gen. Hosp. Psychiatry. 1988; 10:267-77.
55. Patel S.S., Shah V.S., Peterson R.A., Kimmel P.L., Psychosocial variables, quality of life, and religious beliefs in ESRD patients treated with hemodialysis. Am. J. Kidney Dis. 2002; 40:1013-22.
56. Yang T.C., Lin Y.W., Lian J.D., Lee H.S., Tsai S.W.. Hemodialysis duration, gender, nutritional status, hematocrit and SF36 health-related quality of life in patients on hemodialysis. Acta.Nephrologica. 2004; 18: 111-15.
57. Juergensen E., Wuerth D., Finkelstein SH., Juergensen PH., Bekui A., Finkelstein FO..Hemodialysis and peritoneal dialysis: patients' assessment of their satisfaction with therapy and the impact of the therapy on their lives. J. Am. Soc. Nephrol. 2006; 1: 1191-96.
58. Blake C., Codd M.B., Cassidy A., O'Meara YM.. Physical function, employment and quality of life in end-stage renal disease. J. Nephrol. 2000; 13:142-49.
59. Vazquez I., Valderrabano F., Jofre R., Fort J., Lopez-Gomez J.M., Moreno F., Sanz-Guajardo D.. Psychosocial factors and quality of life in young hemodialysis patients with low comorbidity. J. Nephrol. 2003; 16: 886-94.
60. Dekker F.W., Quality of in dialysis patients. Available at www.mapi-esearch_inst.com. Accessed on 2/4/2003.

61. BaiardiF., EspostiE.D., CocchiR., FabbriA., SturaniA., ValpianiG., Fusaroli M.. Effects of clinical and individual variables on quality of life in chronic renal failure patients. J. Nephrol. 2002; 15: 61-7.
62. Julius M., Hawthorne V.M., Carpentier-Alting P., Kneisley J., Wolfe R.A., Port F.K.. Independence in activities of daily living for end stage renal disease patients: Biomedical and demographic correlates. Am. J. Kid. Dis. 1989; 13: 61-9.
63. Groothoff J.W., Grootenhuis M.A., Offringa M., Gruppen M.P., Korevaar J.C., Heymans H.S.A..Quality of life in adults with end-stage renal disease since childhood is only partially impaired. Nephrol. Dial. Transplant. 2003; 18: 310-17.
64. Welch J.L., Austin J.K.. Quality of life in black hemodialysis patients. Adv. Ren. Replace.Ther. 1999; 6:351-57.
65. Acaray A., Pinar R.. Quality of Life in Turkish Hemodialysis Patients. Int. Urol.Nephrol.2005; 37: 595-602.
66. Suet-ChingW.L.. The quality of life for Hong Kong dialysis patients. J. Adv.Nurs. 2001; 35:218-27.
67. BarsoumR.S.. Chronic Kidney Disease in the Developing World. N. Eng. J. Med. 2006; 354: 997-99.
68. Jonge P.D., Ruinemans M.F.G., Huyse F.J., Wee P.M.. A simple risk score predicts poor quality of life and non-survival at 1-year follow-up in dialysis patients. Nephrol. Dial. Transplant. 2003; 18: 2622–28.
69. Harris L.E., Luft F.C., Rudy D.W., Tierney W.M.. Clinical correlates of functional status in patients with chronic renal insufficiency. Am. J. Kidney. Dis. 1993; 21:161-66.
70. Sagduyu A., Sentürk V., Sezer S., Emiroğlu R., Ozel H.S.. Psychiatric Problems, Life Quality and Compliance in Patients Treated with Hemodialysis and Renal Transplantation. Turk.Psikiyatri. Derg. 2006; 17: 22-31.
71. Curtin R.B., Oberly E.T., Sacksteder P., Friedman A.. Differences between employed and nonemployed dialysis patients. Am. J. Kidney Dis. 1996; 27: 533-40.
72. Rasgon S., Schwankowsky L., James-Rigers A., Widrow L., Glick J., Butts E.. An intervention for employment maintenance among blue-collar workers with end-stage renal disease. Am. J. Kidney. Dis. 1993; 22: 403-12.
73. Rocco M.V.,Gassman J.J., Wang S.R., Kaplan R.M..Cross-sectional study of Quality of life and symptoms in chronic Renal Disease patients: The Modification of Diet in Renal Disease study**.** Am. J. Kidney. Dis. 1997**;** 29**:** 888-96.
74. VasileviaI.A..Quality of life in chronic hemodialysis patients in Russia. Hemodial. Int. 2006; 10:274–79.
75. CovicA., Seica A., Gusbeth-Tatomir P., Gavrilovici O., Goldsmith D.J.A.. Illness representations and qualityoflife scores in hemodialysis patients**.** Nephrol. Dial. Transplant. 2004; 19: 2078-83.
76. Tsuji-Hayashi Y., SizerFitts S., Takai I., Nakai S., Shinzato T., Miwa M., *et al.* Health related quality of life among dialysis patients in Seattle and Aichi. Am. J. Kidney. Dis. 2001:37:987-96.
77. Bakewell A.B., Higgins R., Edmunds M.E., Does ethnicity influence perceived qualityoflifeof patients on dialysis and following renal transplant? Nephrol. Dial. Transplant. 2001; 16:1395-1401.
78. Jones M., Ibels L., Schenkel B., Zagari M.. Impact of epoetinalfa on clinical end points in patients with chronic renal failure: A meta-analysis. Kidney. Int. 2004; 65:757–67
79. Revicki D.A., Brown R.E., Feeny D.H., Henry D., Teehan BP., Rudnick M.R., Benz R.L.. Health-related quality of life associated with recombinant human erythropoietin therapy for predialysis chronic renal disease patients. Am. J. Kid. Dis. 1995; 25:548-54.

80. Evans R.W., Rader B., ManninenD.L.. The quality of life of hemodialysis recipients treated with recombinant human erythropoietin. Cooperative Multicenter EPO Clinical Trial Group. JAMA. 1990; 263:825-30.
81. Lindsay RM.. The London, Ontario, Daily/Nocturnal HD study. Sem Dial. 2004; 17:85-91.
82. Williams A.W., Chebrolu S.B., Ing T.S., Ting G., Blagg C.R., Twardowski Z.J., Woredekal Y., Delano B., Gandhi VC., Kjellstrand CM.. Early clinical, quality-of-life, and biochemical changes of "daily hemodialysis" (6 dialyses per week). Am. J. Kid. Dis. 2004; 43:90-102.
83. Heidenheim A.P, Muirhead N., Moist L., Lindsay R.M.. Patient quality of life on quotidian hemodialysis. Am. J. Kid. Dis. 2003; 42:S36-S41.
84. Ting G.O., Kjellstrand C.M., Freitas T., Carrie B.J., ZarghameeS.. Long-term study of high-comorbidity ESRD patients converted from conventional to short daily hemodialysis. Am. J. Kid. Dis. 2003; 42:1020-35.
85. Neto J.F.R., Ferraz M.B., Cendoroglo M., Draibe S., Yu L., SessoR.. Quality of life at the initiation of maintenance dialysis treatment – a comparison between the SF-36 and the KDQ questionnaires. Qual.Life Res. 2000; 9:101-17.
86. Peng Y.S., Chiang C.K., Hung K.Y., Chiang S.S., Lu C.S., Yang C.S.. The association of higher depressive symptoms and sexual dysfunction in male hemodialysis patients. Nephrol Dial Transplant. 2007; 22:857-61.
87. Martín-Díaz F., Reig-Ferrer A., Ferrer-CascalesR..Sexual functioning and quality of life of male patients on hemodialysis. Nephrologia. 2006; 26:452-60.
88. Coelho-Marques F. Z. , Wagner M.B., Figueiredo C.E.P., Avila D.O.. Quality of life and sexuality in chronic dialysis female patients. Int. J.Impot. Res. 2006; 18:539–43.
89. Rosas S.E., Joffe M., Franklin E., Strom B.L., Kotzker W., BrensingerC.. Association of decreased quality of life and erectile dysfunction in hemodialysis patients. Kidney Int. 2003; 64:232-38.
90. Peng Y.S., Chiang C.K., Kao T.W., Hung K.Y., Lu C.S., Chiang S.S., *et al*. Sexual dysfunction in female hemodialysis patients: a multicenter study. Kidney Int. 2005; 68:760-65.
91. Mucsi I., Molnar M.Z., AmbrusC., Szeifert L., Kovacs A.Z., Zoller R.,*et al*. Restless legs syndrome, insomnia and quality of life in patients on maintenance dialysis. Nephrol. Dial. Transplant. 2005; 20:571-77.
92. Unruh M.L.,BuysseD.J.**,** DewM.A., EvansI.V., WuA.W., Nancy E.F.,*et al*.Sleep Quality and Its Correlates in the First Year of Dialysis. Clin. J. Am. Soc. Nephrol. 2006; 1: 802-10.
93. Dogan E., Erkoc R., Eryonucu B., Sayarlioglu H., Agargun M.Y.. Relation between depression, some laboratory parameters, and quality of life in hemodialysis patients. Ren. Fail. 2005; 27:695-99.
94. Weisbord S.D., Fried L.F., Arnold R.M., Fine M.J., Levenson D.J., Peterson R.A., Switzer GE.. Prevalence, severity, and importance of physical and emotional symptoms in chronic hemodialysis patients**.** J. Am. Soc. Nephrol. 2005; 16:2487-94.
95. Nizami A., Abbas S., Aslam F., Minhas F.A., Najam N., Relationship between anxiety, depression, psychological well- being and quality of life in diabetic patients having hemodialysis. JPPS. 2005; 2:80-4.
96. Pisoni R.L., Wikstrom B., Elder SJ.,Akizawa T., Asano Y., Keen ML.. Pruritus in hemodialysis patients: International results from the Dialysis Outcomes and Practice Patterns Study (DOPPS). Nephrol. Dial. Transplant. 2006; 21:3495-505.
97. Merkus M.P., Jager K.J., Dekker F.W., De-Haan R.J., Boeschoten E.W., Krediet R.T..Physical symptoms and quality of life in patients on chronic dialysis: results of The Netherlands Cooperative Study on Adequacy of Dialysis (NECOSAD). Nephrol. Dial. Transplant. 1999; 14:1163-70.

98. Kalantar-Zadeh K., Kopple J.D., Block G., Humphreys MH**..**Association among SF36 Quality of Life Measures and Nutrition, Hospitalization, and Mortality in Hemodialysis. J. Am. Soc. Nephrol. 2001; 12:2797-806.