Original Article

NUTRITIONAL STATUS AND HEALTH RELATED QUALITY OF LIFE OF CHRONIC KIDNEY DISEASE PATIENTS

Mohammad Abul Bashar[1], Md. Emdadul Haque[2], Md. Ziaul Islam[3]

ABSTRACT

Background: Chronic kidney disease is a steadily growing health problem. Malnutrition is common in this irreversible state of kidney failure. The CKD along with malnutrition adversely affect the HRQOL of the patients. This study was conducted to assess the association between nutritional status and HRQOL of CKD patients.

***Methods*:** This cross-sectional study was conducted among 220 CKD patients at Gonoshasthaya Dialysis Centre in Dhaka of Bangladesh during the period from July 2019 to June 2020. Data were collected purposively by using a semi-structured questionnaire with face to face interview, physical examinations and review of medical records.

***Results*:** In this study, majority of the patients were male (67.7%) and mean (±SD) age was 47.59±12.51 years. The patients were higher in proportion (60.0%) in stage 5. Mean (±SD) duration of CKD was 3.8 (±1.83) years. Based on SGA score, majority of the patients (81.8%) were mild to moderately malnourished while 5.5% were severely malnourished. Overall mean (±SD) score of HRQOL was 47.07 (±14.89). The score was higher (53.84±13.60) in KDCS followed by MCS (45.99±21.06) and PCS (41.35±14.92). Mean (±SD) score of HRQOL was 33.27±9.80, 45.67±14.26 and 61.96±9.16 in severely malnourished, mild to moderately malnourished and well-nourished patients respectively ($F = 24.191$, $p < .001$). Correlation between mean score of HRQOL and SGA score was positively significant ($r= .709$, $p<.001$). Age, income, family member, duration of CKD, hemoglobin, serum albumin and SGA score together accounted for 65.6% variability of HRQOL score ($R^2 = 0.656$, adjusted $R^2 = 0.645$, ($F= 57.829$, $p <.001$) with the SGA score recording a higher beta value (beta = 0.474, $p <.001$).

***Conclusion*:** The study found, most of the patients were malnourished with a low level of HRQOL score. Correlation between the mean score of HRQOL and SGA score was significant and strongly positive.

JOPSOM 2021; 40(2):44-51
https://doi.org/10.3329/jopsom.v40i2.61796

Keywords: Chronic Kidney Disease, Nutritional status, Subjective global assessment, Health related quality of life.

1. *Dr. Mohammad Abul Bashar, Associate Professor of Community Medicine, Gonoshasthaya Samaj Vittik Medical College, Savar, Dhaka-1344.*
2. *Professor Dr. Md. Emdadul Haque, MBBS, MPhil. Professor of Nutrition and Biochemistry (Rtd.), National Institute of Preventive and Social Medicine (NIPSOM), Mohakhali, Dhaka-1212.*
3. *Professor and Head, Dept. of Community Medicine, National Institute of Preventive and Social Medicine (NIPSOM), Mohakhali, Dhaka-1212, Bangladesh*

Correspondence: *Dr. Mohammad Abul Bashar, Gonoshasthaya Samaj Vittik Medical College, Savar, Dhaka. Email: drabashar@gmail.com*

INTRODUCTION

Chronic kidney disease is a worldwide health problem of both developed and developing countries. It is an irreversible state of kidney failure where the kidneys do not work properly and fail to maintain balance of water, salt and minerals. Among the world's adult population, 10% has chronic kidney disease [1]. Every year, millions of people die due to lack of affordable treatment facilities [2, 3]. The global burden of CKD is increasing day by day. It is projected to become the fifth cause of years of life lost globally by 2040 [4, 5]. In Bangladesh, prevalence of CKD is 16-18%, of which, 11% belong to stage-III and above [6]. People with comorbidities like diabetes and hypertension have an increased risk for kidney failure [7]. CKD as a progressive disease is defined as the decreased kidney function where glomerular filtration rate (GFR) < 60 ml/min/1.73 m^2 for 3 months or more [8]. Elsewhere it is said CKD if GFR is 90 or less than that [9]. In the ESRD, estimated GFR is < 15 ml/min/1.73 m^2. According to estimation of GFR, CKD is classified as stage 1: GFR = 90 ml/min/1.73 m^2; stage

2: GFR 60-89 ml/min/1.73 m^2; stage 3: GFR 30-59 ml/min/1.73 m^2; stage 4: GFR 15-29 ml/min/1.73 m^2 and stage 5: GFR < 15 ml/min/1.73 m^2 [9]. In ESRD (stage 5), the kidneys have to work harder to get rid of waste, and may stop working altogether. If the kidneys fail to work, toxins and wastes build up in the blood which makes the patients very sick. This is an irreversible state of kidney failure. The patients with ESRD have to live on hemodialysis (or peritoneal dialysis) for the rest of their lives. The only alternative is to transplant a kidney [10].

Malnutrition is a common phenomenon among CKD patients and is associated with higher rates of morbidity and mortality [3, 11]. Malnutrition is the poor nutritional status resulting from inadequate intake of food. In CKD patients, it is multifactorial in origin and characterized by suppressed appetite, catabolism and chronic inflammation. As on BMI, the proportion of malnutrition is 16.9% in CKD patients undergoing hemodialysis [10]. Regarding subjective global assessment (SGA), the proportion of malnutrition is 66.7% in CKD patients undergoing hemodialysis [12]. There are many indicators to evaluate nutritional status in CKD patients. The common measures are BMI, subjective global assessment (SGA), and biochemical markers [11]. The 7-point subjective global assessment (SGA) scale is a widely available clinical tool to measure nutritional status in patients with CKD [13]. The components of SGA are weight, dietary intake, gastrointestinal symptoms, functional capacity, disease state affecting nutritional requirements, subcutaneous fat, muscle wasting and edema [14].

Health related quality of life (HRQOL) is the individuals' perception of their position in life in the context of the culture and value system in which they live and in relation to their goals, expectations, standards and concerns [15,16]. Patients' quality of life is the functional impact of a disease or its treatment on the subjective feeling of the patients in relation to their physical, mental, spiritual, emotional, social and functional wellbeing [16]. CKD exerts an adverse effect on patients' health-related quality of life mostly due to the accompanied impairment or to the imposed limitations in almost all domains of their daily lives and is associated with increased mortality and morbidity [4, 17].

In CKD, patients are under dietary restrictions. They also lose their appetite which may cause malnutrition. Nutritional status is an important factor that determines the overall quality of life of CKD patients [16]. CKD itself and its end stage treatment modality affect the nutritional status of patients adversely [18, 19]. On the other hand, CKD and malnutrition interfere patient's quality of life. The objective of this study was to assess the HRQOL of CKD patients and to explore the association between nutritional status and HRQOL.

METHODS

Study design, population, sampling and data collection

This cross-sectional study was conducted at the Gonoshasthaya Dialysis Centre in Dhaka of Bangladesh from July 2019 to June 2020. The study included all the indoor and outdoor CKD patients with stage III, IV and V irrespective of sign-symptom. In this study, 220 patients were enrolled purposively. Data were collected by face to face interview, anthropometric measurements, review of medical records and physical examinations. A semi-structured questionnaire was used in this study.

Assessment of HRQOL

HRQOL was assessed by the KDQOL-SF™ instrument, version 1.3, from RAND Corporation [20]. The instrument has Physical Component Summary**,** Mental Component Summary and Kidney Disease Component Summary. It has 79 items in total. In each item of the instrument, lowest and highest possible score was set at 0 and 100 respectively. Highest score indicated better quality of life.

Assessment of nutritional status

Nutritional status was assessed clinically by 7-Point Subjective Global Assessment (SGA) scale. The scale is a validated tool that was used widely to assess nutritional status of CKD patients [13, 21-23]. The 7-point SGA scale is more time sensitive in its response to nutrition change [13, 14]. It has 8 items. In each item of the scale, lowest and highest possible score was set at 1 and 7 respectively. Nutritional status was classified as severely malnourished (score 1-2), mild to moderately malnourished (score 3-5) and well-nourished (score 6-7).

Internal consistency reliability

The internal consistency reliability for the SGA scale and KDQOL-SF™ scale were judged by using pre-test data. The Cronbach's alpha value for SGA scale (.86) and KDQOL-SF™ scale (.91) proved the adequate internal consistency.

Data analysis

Data were analyzed by SPSS software (version 23.0, IBM statistical product). Descriptive statistics measured frequency, mean and standard deviation. Inferential statistics included t-test, ANOVA, chi

square test, and regression analysis. Statistical significance was defined as $p < .05$.

Ethical considerations

Ethical clearance was taken from the Institutional Review Board of National Institute of Preventive and Social Medicine (NIPSOM), Dhaka, Bangladesh. Informed consent from the patient was also taken. The respondents had full freedom to withdraw their consent at any stage of the study.

RESULTS

Table 1 shows that 67.7% of respondents were male, 53.6% were in 41-60 years age group, 24.1% had secondary level of education, 83.6% were employed in different occupation and 46.8% had monthly income within TK. 10,001-26,000.

Table 1. Baseline characteristics of the patients (n=220)

Baseline characteristics	Frequency	Percentage
Sex		
Male	149	67.7
Female	71	32.3
Age in years		
18-40	74	33.6
41-60	118	53.6
≥61	28	12.7
Mean (±SD)	47.59 (±12.51)	
Education		
No formal education	40	18.2
Primary	43	19.5
Secondary	53	24.1
Higher secondary	34	15.5
Graduate and above	50	22.7
Employment status		
Employed	184	83.6
Unemployed	36	16.4
Total household income		
5000 to 10,000	64	29.1
10,001-25,000	103	46.8
25,001-50,000	53	24.1
Mean (±SD)	20163.64 (±11295.15)	
Family member		
2-4	116	52.7
≥5	104	47.3

Table 2 shows that 52.2% respondents had CKD for 1-3 years and 60.0% respondents had CKD with stage 5.

Table 2. Clinical attributes of the patients

Clinical attributes	Frequency	Percentage
Duration of CKD		
1-3 years	115	52.2
4-6 years	87	39.5
7-10 years	18	8.2
Mean(±SD)	3.8(±1.83)	
Stage of CKD		
Stage 3	53	24.1
Stage 4	35	15.9
Stage 5	132	60.0

Table 3 shows that 81.8% respondents were mild to moderately malnourished, 5.5% were severely malnourished 12.7% were well nourished.

Table 3. Nutritional status of the CKD patients (n = 220)

Nutritional status	Frequency	Percentage
Severely malnourished	12	5.5
Mild to moderately malnourished	180	81.8
Well nourished	28	12.7

Table 4 shows that mean (±SD) score of overall HRQOL was 47.0653 (±14.88), PCS score was 41.3501(±14.92), MCS score was 45.9986(±21.06) and KDCS was 53.8472(±13.60).

JOPSOM 2021; 40(2):44-51 https://doi.org/10.3329/jopsom.v40i2.61796

Table 4. Distribution of respondents by mean score of HRQOL (n = 220)

Domains	Minimum	Maximum	Mean	SD
Overall HRQOL	17.58	72.92	47.0653	14.8889
Physical component summery	14.79	65.63	41.3501	14.9214
Mental component summery	4.25	83.50	45.9986	21.0629
Kidney disease component summery	22.92	77.99	53.8472	13.6037
General health	4.17	54.17	32.8410	13.7955
Physical functioning	10.00	75.00	54.2727	13.2496
Role physical	.00	75.00	24.7727	24.8271
Pain	10.00	77.50	53.5114	19.0626
Emotional well-being	8.00	68.00	45.5455	17.7041
Role emotional	.00	100.00	52.2695	44.5981
Social function	.00	100.00	50.0341	27.9373
Energy/vitality	.00	70.00	36.1364	17.2035
Symptom/problem of CKD	31.25	93.75	61.5831	13.3129
Effects of CKD	17.86	71.43	53.6050	16.3580
Burden of CKD	.00	68.75	35.2841	18.7278
Work status	.00	50.00	33.1818	23.6771
Cognitive function	26.67	86.67	70.2126	13.6702
Quality of social interaction	20.00	80.00	61.7569	12.9204
Sleep	17.50	92.50	59.3295	18.0903
Social support	.00	100.00	55.8304	21.4283
Patient satisfaction	0	83.00	43.85	15.069

Table 5 shows that mean score of HRQOL was more (54.6912±13.291) in CKD patients with 1-3 years. In stage 3, it was 63.1777±8.534.

Table 5. Comparison of mean score of HRQOL by clinical attributes of patients (n=220)

Clinical attributes	Mean score of HRQOL	Significance
Duration of CKD		F = 45.429
1-3 years	54.6912±13.291	df = 2
4-6 years	39.5022±12.343	p <.001
7-10 years	34.8998±7.576	
Stage of CKD		F = 94.049
Stage 3	63.1777±8.534	df = 2
Stage 4	51.9387±8.936	p <.001
Stage 5	39.3038±12.201	

Table 6 shows that mean score of HRQOL was 33.2653±9.7970, 45.6680±14.255 and 61.9626±9.1630 in the severely malnourished, mild to moderately malnourished and well-nourished patients respectively.

Table 6. Association between mean score of HRQOL and nutritional status

Nutritional status	Mean score of HRQOL	Significance
Severely malnourished	33.2653±9.7970	F = 24.191
Mild to Moderately malnourished	45.6680±14.255	df = 2
Well-nourished	61.9626±9.1630	p < .001

Figure 1 shows positive correlation between mean score of HRQOL and nutritional status (SGA), $R^2 = 0.503$, F (1,218) = 220.523, p < .001.

Figure 1. Linear regression between mean score of HRQOL and SGA score (nutritional status)

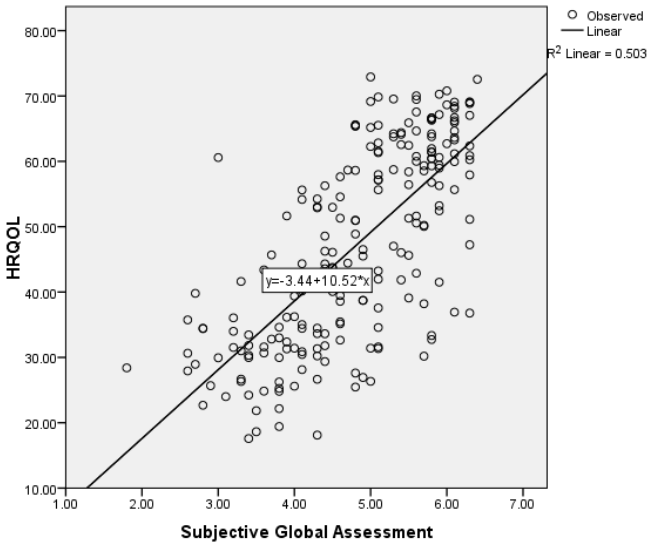

Table 7 shows that age, income, family member, duration of CKD, hemoglobin level, serum albumin level and nutritional status accounted for 65.6% variability of HRQOL with the SGA recording a higher beta value (beta = 0.474, p <0.001).

Table 7. Binary logistic regression between mean score of HRQOL and associated predictor variables, R^2 = .656, adjusted R^2 = .645, F (7, 212) = 57.829, p <.001

Predictor variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% CI for B	
	B	Std. Error	Beta			Lower bound	Upper bound
Age	-.173	.060	-.146	-2.885	.004	-.292	-.055
Income	.000	.000	.214	4.783	.000	.000	.000

JOPSOM 2021; 40(2):44-51 https://doi.org/10.3329/jopsom.v40i2.61796

Family member	-1.942	.456	-.204	-4.255	.000	-2.842	-1.042
Duration of CKD	.040	.431	.005	.094	.926	-.808	.889
Hemoglobin	.784	.410	.086	1.913	.057	-.024	1.593
Albumin	1.061	1.406	.033	.755	.451	-1.710	3.833
Nutritional status (SGA)	7.034	.747	.474	9.422	.000	5.563	8.506

DISCUSSION

This cross-sectional study was conducted to assess the association between nutritional status and HRQOL in chronic kidney disease patients. Among 220 CKD patients, the majority (67.7%) were male. Mean age of the respondents was 47.59±12.51 years. In this study, 18.2% patients had no formal education, 24.1% were SSC passed, 16.4% were unemployed, mean income was BDT 20163.64±11295. Majority of the respondents (63.6%) belonged to the nuclear family while mean family members were 4.84±1.56. Majority of the respondents (52.3%) had been suffering from CKD for 1-3 years while 39.9% had been suffering for 4-6 years and 8.2% for more than 6 years. Of all, the majority (60.0%) were in stage 5 while 15.9% were in stage 4 and 24.1% were in stage 3.

In this study, overwhelming majority (81.8%) of the respondents were mild to moderately malnourished while 5.5% were severely malnourished. Only 12.7% of patients were well-nourished. A study using the SGA scale found 48% of the patients were mild to moderately malnourished [23]. This study explored that mean (±SD) score of overall HRQOL was 47.07 (±14.89) which was higher (53.8472±13.60) in KDCS followed by MCS (45.9986±21.06) and PCS (41.3501±14.92). A study using the same scale found the mean score of overall HRQOL was 50.0±17.0 [24]. This is little more than the finding of the present study. Another study conducted in CKD patients also found HRQOL was higher in KDCS followed by MCS and PCS [4]. One more study found higher score (38.5±12.8) in MCS than PCS (32.9±10.5) [25].

This study found a significant inverse relationship between mean score of HRQOL and duration of CKD. Mean score of HRQOL was more (54.6912±13.291) in patients with CKD of 1-3 years. In contrast, it was 39.5022±12.343 in patients with CKD of 4-6 years and 34.8998±7.576 in patients with CKD of more than 6 years ($p < .001$). Several studies regarding quality of life in CKD patients found an inverse relationship between duration of disease and HRQOL [26-28]. This study revealed that quality of life deteriorated with the stages of CKD and the lowest score was in stage 5. It was 63.1777±8.534, 51.9387±8.936 and 39.3038±12.201 in stage 3, stage 4 and stage 5 respectively ($p < .001$). As seen in another study, HRQOL was also lowest in stage 5 [25]. The other study found no significant association between quality of life and stages of CKD [29].

The present study found a significant relationship between nutritional status and mean score of HRQOL. It was found higher (61.9626±9.163) in well-nourished patients than severely malnourished (33.2653±9.797) and mild to moderately malnourished patients (45.6680±14.255) ($p < .001$). In linear regression analysis, it was seen that, one unit change of SGA score will cause 50.3% change of mean score of HRQOL. As on binary logistic regression analysis age, household monthly income, number of family members, duration of CKD, hemoglobin level, serum albumin level and nutritional status, all together accounted for 65.6% variability of HRQOL ($R^2 = .656$, adjusted $R^2 = .645$, $F(7, 212) = 57.829$, $p < .001$) with the nutritional status recording a higher beta value (beta = .474, $p < .001$). A few similar studies assessed nutritional status by SGA scale in CKD patients and found a significant relationship between nutritional status and HRQOL where more the SGA score higher the HRQOL [30-33].

The study has strength, weakness and policy implication as well. In this study a clinical tool SGA scale was used to assess the nutritional status. This was a single centered study. The findings of this study could contribute to reorganize the healthcare delivery system and would aid in optimal supportive healthcare in CKD patients. Therefore, the physicians and the policy makers could provide comprehensive healthcare to maintain a target level of nutritional status as well as HRQOL with appropriate treatment modality.

CONCLUSION

This study explored that the majority of the patients had low levels of HRQOL. Physical component summary score was the lowest. As on the SGA scale, the majority of the patients were malnourished. Impaired HRQOL is mostly associated with

malnutrition. HRQOL was significantly predicted by age, income, family members and nutritional status. Among them, nutritional status mostly predicted the HRQOL in CKD patients. More duration and advanced stage of CKD also exerts a great negative impact on patients' health-related quality of life.

REFERENCES

1. Li PKT, Garcia-Garcia G, Lui SF, Andreoli S, Fung WWS, Hradsky A, et al. Kidney health for everyone everywhere—From prevention to detection and equitable access to care. Nephrology. 2020;25(3):195–201.
2. World Kidney Day (WKD) Theme 2019. Available from: https://www.worldkidneyday.org/2019-campaign/2019-wkd-theme/ (accessed on 20-02-2022).
3. Adejumo OA, Okaka EI. Malnutrition in pre-dialysis chronic kidney disease patients in a teaching hospital in Southern Nigeria. Afr Health Sci. 2016;16(1):234–41.
4. Mujais SK, Story K, Brouillette J, Takano T, Soroka S, Franek C, et al. Health-related quality of Life in CKD patients: Correlates and evolution over time. Clin J Am Soc Nephrol. 2009;4(8):1293–301.
5. World Kidney Day (WKD) Theme 2020. Available from: https://www.worldkidneyday.org/2020-campaign/2020-wkd-theme/ (accessed on 20-02-2022)
6. Rashid HU. Management of End Stage Renal Disease-Bangladesh Perspective. The Open Urology & Nephrology Journal. 2014 Oct;7(1):108-112. DOI:10.2174/1874303X01407010108
7. Laville M, Fouque D. Nutritional aspects in hemodialysis. Kidney Int Suppl. 2000 Aug;76:S133-9. doi: 10.1046/j.1523-1755.2000.07617.x. PMID: 10936810.
8. Levey AS, Eckardt KU, Tsukamoto Y, Levin A, Coresh J, Rossert J, et al. Definition and classification of chronic kidney disease: A position statement from Kidney Disease: Improving Global Outcomes (KDIGO)z. Kidney Int. 2005;67(6):2089–100.
9. Eckardt KU, Berns JS, Rocco MV, Kasiske BL. Definition and classification of CKD: the debate should be about patient prognosis--a position statement from KDOQI and KDIGO. Am J Kidney Dis. 2009 Jun;53(6):915-20. doi: 10.1053/j.ajkd.2009.04.001. Epub 2009 May 5. PMID: 19406541.
10. Rezeq HA, Khdair LN, Hamdan ZI, Sweileh WM. Prevalence of malnutrition in hemodialysis patients: A single-center study in Palestine. Saudi J Kidney Dis Transpl. 2018 Mar-Apr;29(2):332-340. doi: 10.4103/1319-2442.229264. PMID: 29657201.
11. Al-Ali FS, Bieber BA, Pisoni RL, Ezzat H, AlGhonaim M, AlHejaili F, et al. Nutritional status and outcomes in hemodialysis patients from the Gulf Cooperation Council countries enrolled in the dialysis outcome and practice patterns study phase 5 (2012-2015). Saudi J Kidney Dis Transpl [serial online] 2016;27(7):31-41.
12. Cepeda Marte JL, Javier A, Ruiz-Matuk C, Paulino-Ramirez R. Quality of Life and Nutritional Status in diabetic patients on hemodialysis. Diabetes Metab Syndr. 2019 Jan-Feb;13(1):576-580. doi: 10.1016/j.dsx.2018.11.020. Epub 2018 Nov 10. PMID: 30641769.
13. Cooper BA, Bartlett LH, Aslani A, Allen BJ, Ibels LS, Pollock CA. Validity of subjective global assessment as a nutritional marker in end-stage renal disease. Am J Kidney Dis. 2002 Jul;40(1):126-32. doi: 10.1053/ajkd.2002.33921. PMID: 12087570.
14. Lim SL, Lin XH, Daniels L. Seven-Point Subjective Global Assessment Is More Time Sensitive Than Conventional Subjective Global Assessment in Detecting Nutrition Changes. JPEN J Parenter Enteral Nutr. 2016 Sep;40(7):966-72. doi: 10.1177/0148607115579938. Epub 2015 Apr 6. PMID: 25847315.
15. de Vries J, van Heck GL. The World Health Organization quality of life assessment instrument WHOQOL-100: Validation study with the dutch version. European Journal of Psychological Assessment. 1997;13(3):164-178.
16. Tannor EK, Norman BR, Adusei KK, Sarfo FS, Davids MR, Bedu-Addo G. Quality of life among patients with moderate to advanced chronic kidney disease in Ghana - a single centre study. BMC Nephrol [Internet]. 2019;20(1):122. Available from: https://doi.org/10.1186/s12882-019-1316-z

17. Gerasimoula K, Lefkothea L, Maria L, Victoria A, Paraskevi T, Maria P. QUALITY OF LIFE IN HEMODIALYSIS PATIENTS. Mater Sociomed. 2015 Oct;27(5):305-9. doi: 10.5455/msm.2015.27.305-309. Epub 2015 Oct 5. PMID: 26622195; PMCID: PMC4639348.

18. Ebrahimi H, Sadeghi M, Amanpour F, Dadgari A. Influence of nutritional education on hemodialysis patients' knowledge and quality of life. Saudi J Kidney Dis Transpl [serial online] 2016;27(2):250-5.

19. Abraham S, Ramachandran A. Estimation of quality of life in haemodialysis patients. Indian J. Pharm Sci. 2012 Nov;74(6):583-7. doi: 10.4103/0250-474x.110624

20. Hays RD, Kallich J, Mapes D, Coons S, Amin N, Carter WB, et al. Kidney Disease Quality of Life Short Form (KDQOL-SF ™), Version 1.3: A Manual for Use and Scoring. Santa Monica, CA: RAND Corporation, 1997. Available from: https://www.rand.org/pubs/papers/P7994.html.

21. Detsky AS, McLaughlin JR, Baker JP, Johnston N, Whittaker S, Mendelson RA, Jeejeebhoy KN. What is subjective global assessment of nutritional status? 1987. Classical article. Nutr Hosp. 2008 Jul-Aug;23(4):400-7. PMID: 18702178.

22. Steiber A, Kalantar-Zadeh K, Secker D, McCarthy M, Sehgal A, Mccann L. Subjective Global Assessment in chronic kidney disease: A review. J Ren Nutr. 2004 Nov 1;14:191–200.

23. Tapiawala S, Vora H, Patel Z, Badve S, Shah B. Subjective global assessment of nutritional status of patients with chronic renal insufficiency and end stage renal disease on dialysis. J Assoc Physicians India. 2006 Dec;54:923-6. PMID: 17334008.

24. Saha SK, Mansur MA, Chowdhury SR, Khan MAW, Iqbal M, Chowdhury AA, et al. Quality of Life of Patients on Maintenance Hemodialysis in Relation to Hemoglobin Level: A Multicenter Study from a Developing Country. BIRDEM Med J 2017;7(3):198-204. https://doi.org/10.3329/birdem.v7i3.33780.

25. Aggarwal HK, Jain D, Pawar S, Yadav RK. Health-related quality of life in different stages of chronic kidney disease, QJM: An International Journal of Medicine. 2016 Nov;109(11):711–716. https://doi.org/10.1093/qjmed/hcw054

26. Finkelstein FO, Wuerth D, Finkelstein SH. Health related quality of life and the CKD patient: challenges for the nephrology community. Kidney Int. 2009 Nov;76(9):946-52. doi: 10.1038/ki.2009.307. Epub 2009 Aug 12. PMID: 19675529.

27. Pugh-Clarke K, Naish PF, Mercer TM. Quality of life in chronic kidney disease. EDTNA ERCA J. 2006;32(3):167–71.

28. Joshi U, Subedi R, Poudel P, Ghimire PR, Panta S, Sigdel MR. Assessment of quality of life in patients undergoing hemodialysis using WHOQOL-BREF questionnaire: a multicenter study. Int J Nephrol Renovasc Dis. 2017 Jul 19;10:195-203. doi: 10.2147/IJNRD.S136522. PMID: 28790861; PMCID: PMC5529382.

29. Cruz MC, Andrade C, Urrutia M, Draibe S, Nogueira-Martins LA, Sesso Rde C. Quality of life in patients with chronic kidney disease. Clinics (Sao Paulo). 2011;66(6):991-5. doi: 10.1590/s1807-59322011000600012. PMID: 21808864; PMCID: PMC3130152.

30. Sohrabi Z, Eftekhari MH, Eskandari MH, Rezaeianzadeh A, Sagheb MM. Malnutrition-inflammation score and quality of life in hemodialysis patients: is there any correlation? Nephrourol Mon. 2015 May 23;7(3):e27445. doi: 10.5812/numonthly.7(3)2015.27445. PMID: 26034747; PMCID: PMC4450166.

31. Mohammed SGS, Abdallah FAA. Nutritional Status and Quality of Life among Hemodialysis Patients in Omdurman Military Hospital (Hemodialysis Center) (November 2017–March 2018). Clin J Nutr Diet 2019;2(1):1-8.

32. Dwyer JT, Larive B, Leung J, Rocco M, Burrowes JD, Chumlea WC, et al. Hemodialysis Study Group. Nutritional status affects quality of life in Hemodialysis (HEMO) Study patients at baseline. J Ren Nutr. 2002 Oct;12(4):213-23. doi: 10.1053/jren.2002.35297. PMID: 12382213.

33. Feroze U, Noori N, Kovesdy CP, Molnar MZ, Martin DJ, Reina-Patton A, et al. Quality-of-life and mortality in hemodialysis patients: roles of race and nutritional status. Clin J Am Soc Nephrol. 2011 May;6(5):1100-11. doi: 10.2215/CJN.07690910. Epub 2011 Apr 28. PMID: 21527646; PMCID: PMC3087777.