Health-related Quality of Life and Risk of Malnutrition among Persons on Maintenance Haemodialysis

PR Prout, SD Nichols

ABSTRACT

Objectives: The purpose of this study was to determine health-related quality of life (HRQOL) and risk of malnutrition among persons with chronic kidney disease (CKD), on maintenance haemodialysis.

Methods: A mixed-method approach consisting of a case-control study followed by detail interviews was employed. Cases had three haemodialysis sessions per week. Controls were persons diagnosed with hypertension and or diabetes mellitus attending clinics at the same healthcare facility. Face-to-face interviews were conducted using a standardized questionnaire consisting of the SF-12 and mini nutritional assessment questionnaire as well as sociodemographic, health-related symptoms, food frequency and physical activity. Anthropometry was assessed using standard procedures. Sixty participants completed the questionnaires on two occasions, eight weeks apart. The study was approved by The University of the West Indies Ethics Committee.

Results: Four hundred and seventy-three persons (cases = 150; controls = 323) participated in the study. Among female haemodialysis participants Cronbach alpha for physical component scores were 0.68 and 0.75 for mental component scores. Among male haemodialysis participants Cronbach alpha were 0.5 for mental component scores and 0.53 for physical component scores. There were no significant differences in the age, body mass index and genders between cases and controls. Cases were more likely than controls to be at increased risk for poorer HRQOL and malnutrition. Malnutrition scores were positively associated with physical component scores ($p = 0.025$) and mental component scores ($p = 0.002$)

Conclusion: Cases had poorer health-related quality-of-life and were at higher-risk of malnutrition than controls.

Keywords: Chronic kidney disease, health-related quality of life, haemodialysis, malnutrition

---

From: Department of Agricultural Economics and Extension, Nutirtion Group, The University of the West Indies, St Augustine, Trinidad and Tobago.

Correspondence: Ms Patrice Prout, The University of the West Indies, St Augustine, Trinidad and Tobago. Tel: (868) 296-7039. Email: patricerp@gmail.com

INTRODUCTION

Chronic kidney disease (CKD), a progressive decline in glomerular filtration rate, is a major cause of illness and death globally (1, 2). With an incidence of 29.2 per 100 000, Trinidad and Tobago has one of the highest incidences of CKD in Latin America and the Caribbean. Diabetes mellitus and hypertension are the two most important risk factors for CKD locally (3, 4). With progression, CKD ultimately leads to end-stage renal disease (renal failure) requiring dialysis or transplantation. Dialysis is associated with poor health-related quality of life [HRQOL] (5, 6). Furthermore, subjective HRQOL is a well-known predictor of disease outcome. Renal failure is associated with declines in nutritional status due to altered metabolism, fatigue, psychological dysfunction and poor appetite. Dialysis exacerbates nutritional issues with CKD as dietary restrictions are required for patient management (7, 8). Despite the large number of persons with CKD on dialysis, there is a paucity of relevant studies on HRQOL and associated issues in this population regionally (4). The purpose of this study was to determine HRQOL and risk of malnutrition among persons with chronic kidney disease on maintenance haemodialysis (CKD-HD).

MATERIALS AND METHODS

This study employed a mixed-method approach, a case-control study followed by detail interviews of participants were used. Cases were persons with CKD receiving haemodialysis three-times per week. Controls were persons diagnosed with hypertension or diabetes mellitus attending clinics at the same institution. To observe an odds ratio of at least 2.0 in the prevalence of poor HRQOL with a case to control ratio of 1:2 with 90% power at the 95%

significance level, assuming 30% of controls experience poor HRQOL, we needed at least 473 participants [cases = 150; controls = 323] (9, 10).

Participants were recruited during the period of September 1, to December 31, 2016. Prior to enrolment, they were informed of the nature of the study. All consents were witnessed by members of the various healthcare teams. Ethical approval was obtained from the Ethics Committee, The University of The West Indies. On the day of interview, participants filled out a questionnaire consisting of sociodemographic, dietary behaviours, physical activity, HRQOL, mini-nutritional assessment tool (MNA) and food security items. Health-related quality of life was evaluated using the 12-Item Short Form Survey (SF-12). Sixty participants completed the questionnaires on two occasion eight weeks apart. The validity and reliability of the SF-12 in assessing HRQOL has been demonstrated in a variety of settings (11).

The SF-12 measures eight domains of health. These are physical functioning (PF), role limitations due to physical health problems (RP), body pain (BP), general health (GH), vitality (VT), social functioning (SF), role limitations due to emotional problems (RE) and mental health (MH). These are summarized into physical component (PCS) and mental component summary scores [MCS] (12). Poor HRQOL summary scores determined by this instrument have been shown to be predictive of disease outcomes (12). Risk of malnutrition was assessed with the Mini-Nutrition Assessment (MNA) questionnaire. The MNA has been validated for use in a variety of settings including clinics, institutions and community (12). Participants had anthropometry measured using standard procedures (13). In addition, detailed interviews on HRQOL were conducted with sixty participants (CKD-HD = 20; Non-CKD-HD = 40). These were put into themes and important issues categorized.

Statistics

Data were analysed using SPSS version 23. Prior to analyses, data were inspected for errors and required changes made. Physical component scores and MCS summary scores less than 40 and 45, respectively were categorised as increased risk of poor HRQOL in these domains (14, 15). Participants with MNA scores less than eight were considered to be at increased risk for malnutrition. Similarly, qualitative data were coded and categorised by themes relevant to HRQOL issues. Differences in means of continuous variables between CKD-HD groups were analysed using the *t*-tests and its non-parametric equivalent, the Mann-Witney U test. Chi-squared test was used to determine between ordered categorical data. The results were presented as percentages, means ± standard errors/deviation (SE/SD) and odds ratios. Test-retest reliabilities were analysed using Cronbach alpha (16). Cronbach alpha greater than 0.7 were considered acceptable. Finally, *p*-values < 0.05 was considered statistically significant.

RESULTS

The test-retest reliabilities differed by gender among CKD-HD status. Mental component summary scores and PCS test-retest reliabilities were 0.75 and 0.68, respectively among females and 0.50 and 0.53, respectively among males. For controls, MCS and PCS test-retest reliabilities were 0.93 and 0.75, respectively. Table 1 shows the characteristics of participants by CKD-HD status. There were no significant differences in age, gender, ethnicity, education and anthropometry between CKD-HD and non-CKD-HD.

1. Table 1: Sociodemographic, anthropometric, and lifestyle behaviours of participants by haemodialysis status.

Variables	**CKD-HD n = 150 (Mean ± SE)**	**Non-CKD-HD n = 323 (Mean ± SE)**	***p*-value**
Age (years)	58.2 ± 16.9	59.8 ± 18.4	0.35
Male/ Female (%)	50.7/49.3	50.2/49.8	0.92
Ethnicity (%)			
Indo-Trinidadian	42.7	30.3	
Afro-Trinidadian	41.2	51.1	
Mixed	15.4	18.6	0.04
Years of schooling (%)			
< 8 years	32.7	38.4	
> 8 years	67.3	61.6	0.11
Employment (%)			
No	88.7	67.5	
Yes	11.3	32.5	< 0.001
Income (%)			
< 4000	92.0	70.0	
> 4000−6999	8.0	30.0	< 0.001
Weight (kg)	67.7 ± 12.1	71.7 ± 12.2	0.001
Height (cm)	171.8 ± 14.6	173.9 ± 17.3	0.18
Waist circumference (in)	36.01 ± 5.2	37.6 ± 5.1	0.71
Waist-to-Height ratio	0.5 ± 0.07	0.5 ± 0.07	0.79
BMI (kg/m^2)	23.2 ± 4.8	24.0 ± 4.9	0.90
MNA Score	7.3 ± 2.3	8.9 ± 2.0	< 0.001
MNA < 8 (%)	62.0	38.0	< 0.001
Physical Activity level ≥ 90 minutes /week (%)	19.3	46.1	< 0.001

CKD-HD: chronic kidney disease on haemodialysis; Non-CKD-HD = non-haemodialysis participants; MNA: Mini-Nutrition Assessment; BMI: body mass index.

Chronic kidney disease on haemodialysis participants were more likely to be of East Indian descent while non-CKD-HD were more likely to be of African descent. Non-CKD-HD were significantly heavier and more active than CKD-HD. They were also at lower-risk for under nutrition. Overall, males were more likely than females to have a PF (54.9% *vs* 45.1%; $p = 0.002$) and PCS (71.6% *vs* 62.5%; $p = 0.034$) scores < 40. Among persons with CKD-HD, males were significantly more likely than females to have RE (54.2% *vs* 45.8%; $p = 0.024$)

and RP (55.3% *vs* 44.7%; $p = 0.003$) scores < 40. Chronic kidney disease on haemodialysis participants were significantly more likely than non-CKD-HD to be at increased risk of malnutrition (62.0% *vs* 38.0%; $p = < 0.001$). In multivariate regression analyses controlling for age, gender, ethnicity, education, employment, income and co-morbidities, MNA scores were positively associated with PCS ($p = 0.025$) and MCS ($p = 0.002$) scores.

Table 2 shows SF-12 subscales and summary scores among participants by CKD-HD status. With the exception of VT scores, persons receiving CKD-HD had significantly lower subscales and summary scores than non-CKD-HD.

Table 2: 12-Item Short Form Survey subscales and summary scores among participants by maintenance haemodialysis status.

Variables	**CKD-HD n = 150 (Mean ± SE)**	**Non- CKD-HD n = 323 (Mean ± SE)**	***p*-value**
Role limitation due to physical problems (RP)	13.3 ± 2.5	61.0 ± 2.6	< 0.001
Bodily pain (BP)	85.2 ± 1.4	94.4 ± 0.7	< 0.001
Social functioning (SF)	56.0 ± 3.4	87.2 ± 1.7	< 0.001
General health (GH)	40.8 ± 2.8	53.8 ± 1.2	< 0.001
Role limitation due to emotional problems (RE)	14.4 ± 2.6	62.2 ± 2.5	< 0.001
Vitality (VT)	50.7 ± 3.0	49.5 ± 1.3	0.69
Mental health (MH)	52.6 ± 1.7	57.7 ± 1.0	0.007
Physical functioning (PF)	12.2 ± 2.2	30.0 ± 2.1	< 0.001
Physical component summary score (Mean ± SD)	39.4 ± 5.7	43.5 ± 6.8	< 0.001
Mental component summary score (Mean ± SD)	38.4 ± 6.8	43.1 ± 8.0	< 0.001

CKD-HD: chronic kidney disease on haemodialysis; Non-CKD-HD = non-haemodialysis participants.

Tables 3 shows the proportion of participants having SF-12 subscales and summary scores indicative of poor HRQOL by CKD-HD status. With the exception of MH and BP, CKD-HD were significantly more likely than non-CKD-HD to have SF-12 summary and subscale scores indicative of poorer HRQOL in the relevant domains. These were independent of age, gender, ethnicity, education levels and co-morbidities.

Table 3: The proportion of participants having SF-12 subscales and summary scores indicative of poor HRQOL by haemodialysis status.

Variables	**CKD-HD n = 150 (Mean ± SE)**	**Non- CKD-HD n = 323 (Mean ± SE)**	**Odds-Ratio (95% CI) Referent = Case**	***p*-value**
Role limitation due to physical problems (RP)	82.0 ± 3.1	34.3 ± 2.6	8.7 (5.4, 14.0)	< 0.001
Bodily pain (BP)	10.0 ± 2.5	5.3 ± 1.2	2.0 (1.0, 4.1)	0.087
Social functioning (SF)	42.6 ± 4.1	13.3 ± 1.8	4.8 (3.1, 7.6)	< 0.001
General health (GH)	41.3 ± 4.1	16.1 ± 2.0	3.7 (2.4, 5.7)	< 0.001
Role limitation due to emotional problems (RE)	80.0 ± 3.3	30.3 ± 2.6	9.2 (5.8, 14.6)	<0.001
Vitality (VT)	32.0 ± 3.8	14.5 ± 1.9	2.8 (1.7, 4.4)	< 0.001
Mental health	23.3 ± 3.5	18.8 ± 2.1	1.3 (0.8, 2.1)	0.264
Physical functioning (PF)	83.3 ± 3.1	58.8 ± 2.7	3.5 (2.2, 5.7)	< 0.001
Physical component Summary Score (PCS)	84.8 ± 2.7	58.8 ± 3.	3.9 (2.4, 6.3)	<0.001
Mental component Summary Score (MCS)	90.6 ± 2.4	66.8 ± 2.6	4.8 (2.6, 8.7)	< 0.001

CKD-HD: chronic kidney disease on haemodialysis; Non-CKD-HD = non-haemodialysis participants.

Male CKD-HD participants were significantly more likely than their female counterparts to have PCS summary scores less than 41 (odds ratios (OR) = 2.55; 95% confidence interval (CI) 1.02, 6.67: $p = 0.0046$). While there were no statistical significance for MCS summary scores among male CKD-HD participants.

Results of qualitative analyses indicate that CKD-HD participants were significantly more likely than non-CKD-HD to report psychological/emotional stress related to: routine daily tasks (60% *vs* 33%; $p = 0.04$). They were also more like than non-CKD-HD to report

being negatively affected by death of peers (60% *vs* 15%; $p = 0.001$), disease complications (94% *vs* 26%; $p < 0.001$), medical concerns about their condition (62% *vs* 5.6%; $p < 0.001$) and post-treatment symptoms (81% *vs* 7%; $p < 0.001$).

DISCUSSION

Our results indicate that persons with CKD-HD experienced poorer HRQL than their counterparts with hypertension or diabetes mellitus, the predominant causes of kidney failure in this population (3, 4, 17). This finding is consistent with studies conducted in a variety of settings and suggests that kidney failure leading to haemodialysis may be an additional contributor to poorer HRQOL among participants independent of underlining co-morbidities, diabetes mellitus and hypertension (18, 19). Similarly, it further amplifies the fact that within this cohort the highest percentage of deaths were among male CKD-HD participants. This is important as poor HRQOL is an important predictor of disease outcomes among persons receiving maintenance haemodialysis (20). Factors leading to poor HRQOL among persons on CKD-HD include fatigue, frailty, impaired mobility, rapid physical decline (21). In our study, cases were more likely than controls to report impaired mobility due to physical disabilities. This reduced their ability to perform routine non-occupational activities (21).

Mental HRQOL among persons on haemodialysis is a diverse and complex issue. Negative emotional states (depression and anxiety) are important predictors of poor physical and mental HRQOL (22). Challenges faced by persons on CKD-HD that created anxiety included inability to manage effectively their condition, death of peers, their illness and its co-morbid conditions and the cost related to treatment, especially in the absence of family support. This cost may be as high as $100 US per week (23). These are important

considerations as the majority of participants were unemployed and earned incomes less than $600 US per month. Additionally, 98% of them took ≥ 5 medications per day. Such drugs are expensive to purchase when not available at government sponsored pharmacies. Thus, socio-economic issues that affect financial security were important sources of anxiety and poor mental health among CKD-HD (24).

Although there were no statistically significant differences in anthropometry between CKD-HD and non-CKD-HD, nutrition plays an important role in the management of persons on dialysis. Declines in mental and physical component scores are most often coupled with poor nutritional status among renal patients (24). Dietary restrictions form a common part of management protocols for such persons and increase the risk of nutrient deficiencies (25).

The best therapeutic approach to prevent nutritional related hazards can be achieved by giving proper dietary counselling prior to the initiation of haemodialysis with an aim to maintain normal quality of life (QOL) and nutritional status (26). The ESRD patients on maintenance HD with confirmed PEM should be immediately offered either specific treatment (supplemental food, centered on parenteral nutrition) or experimental form of treatments (amino acid supplementation in dialysate, use of appetite stimulant and growth factor).

In a study by Bossola M *et al*, intradialytic parenteral nutrition did not show improvement on survival but it showed improvements in serum albumin and bodyweight (27, 28). As the malnutrition has been recognized as predictor of morbidity and mortality, nutritional hazards should be considered as an accountable and challenging issue to the nephrologist (29).

In fact, our results suggest that participants on CKD-HD were at greater-risk of malnutrition compared to their non-CKD-HD counterparts. This may have been exacerbated

by poor appetite associated with depression, difficulty chewing and mandatory dietary restrictions (21−23).

Strengths

Previous studies on quality of life among adults in the region focussed on issues known to be associated with ESKD such as diabetes mellitus. This study focusses on HRQOL from the perspective of persons on haemodialysis. It provides both quantitative and qualitative insights into the nature of HRQOL experience of persons on CKD-HD. Evidence suggest that patient reported HRQOL is predictive of health outcomes (30). In our study, CKD-HD were significantly more like than their non-CKD-HD counterparts to experience poor PCS (OR = 3.9; 95% (CI) 2.4, 6.3: p = < 0.001) and MCS (OR = 4.8; 95% (CI) 2.6, 8.7: p = < 0.001). Our two-year follow-up of this cohort at one of the two participating centres has revealed that cohort 31 of 65 (47%) participants have died. This is consistent to the two-year mortality rates for CKD-HD (31). This suggest that poor HRQOL may be predictive of adverse health outcomes in our population.

Limitation

We did not evaluate bio-chemical data and therefore, could not identify specific nutrient deficiencies among participants. The level of depression and anxiety were not measured. This limits our interpretation of many issues surrounding psychological HRQOL among participants. The non-randomize sampling of participants reduces generalization of these findings to local and regional populations of persons receiving haemodialysis (22). The lower Cronbach alpha values among males may reflect a progressing worsening of their physical functioning. In fact, males form the majority of death in this cohort over the past two years.

CONCLUSION

Chronic kidney disease patients on maintenance haemodialysis were at increased risk for poorer HRQOL and malnutrition. Additionally, risk of malnutrition was associated with poorer HRQOL.

REFERENCES

1. Jha V, Garcia-Garcia G, Iseki K, Li Z, Naicker S, Plattner B, et al. Chronic kidney disease: global dimension and perspectives. *Lancet*. 2013; 20; **382**:260-72.

2. Fraser SD, Roderick PJ, May CR, McIntyre N, McIntyre C, et al. The burden of co-morbidity in people with chronic kidney disease stage 3: a cohort study. *BMC Nephrol. 2015;* **16**:193.

3. Health Grove. Chronic Kidney Disease in Trinidad and Tobago-Statistics on Overall Impact and Specific Effect on Demographic Group. http://global-disease-burden.healthgrove.com/l/67192/Chronic-Kidney-Disease-in-Trinidad-and-Tobago. Accessed on November 13th 2017.

4. Soyibo AK, Roberts L, Douglas LL, Barton EN. Renal disease in the Caribbean: the disease of the past, present and future. *West Indian Med J. 2012;* **61**:418-21

5. Finkelstein FO, Wuerth D, Finkelstein SH. Health-related quality of life and the CKD patient: challenges for the nephrology community. *Kidney Int.* 2009; **76**: 946-52.

6. Cruz MC, Andrade C, Urrutia M, Draibe S, Nogueira-Martins LA, Sesso RC. Quality of life in patients with chronic kidney disease. *Clinics (Sao Paulo).* 2011; **66**: 991–95.

7. Ikizler TA. A patient with CKD and poor nutritional status. *Clin J Am Soc Nephrol.* 2013; **8**: 2174-82.

8. Bonanni A, Mannucci I, Verzola D, Sofia A, Saffioti S, Gianetta E, et al. Protein-energy wasting and mortality in chronic kidney disease. *Int J Environ Res Public Health. 2011;* **8**:1631-54.

9. Fleiss LJ, Levin B, Cho Paik. Statistical methods for rates and proportions. Wiley, New Jersey. 2003.

10. Sullivan MK., Dean AG., Mir AR. OpenEpi - Sample Size for Unmatched Case-Control Studies. http://www.openepi.com/SampleSize/SSCC.htm. Accessed May 2016.

11. Vilagut G., Valderas JM., Ferrer M., Garin O., López-García E., Alonso J. Interpretation of SF-36 and SF-12 questionnaires in Spain: physical and mental components. Med Clin (Barc). 2008; **130**:726-35.

12. Kaiser MJ, Bauer JM, Ramsch C, Uter W, Guigoz Y, Cederholm T, et al. Validation of the Mini Nutritional Assessment short-form (MNA-SF): a practical tool for identification of nutritional status. *J Nutr Health Aging.* 2009; **13**:782-88.

13. Lohman TG, Roche AF, Martorell R eds. Anthropometric standardization reference manual. Champaign, Ill, USA: Human Kinetics Books 1988.

14. Vilagut G, Forero CG, Pinto-Meza A, Haro JM, de Graaf R, Bruffaerts R et al. The mental component of the short-form 12 health survey (SF-12) as a measure of depressive disorders in the general population: results with three alternative scoring methods. Value Health. 2013; **16**:564-73.

15. Ware J, Kosinski AM, Keller DS. SF-12: How to Score the SF-12 Physical and Mental Health Summary Scales. https://www.researchgate.net. [Cited 24 May 2018].

16. WHAT DOES CRONBACH'S ALPHA MEAN? SPSS FAQ. https://stats.idre.ucla.edu/spss/faq/what-does-cronbachs-alpha-mean/. [Cited 24 May 2018].

17. Zimbudzi E, Lo C, Ranasinha S, Gallagher M, Fulcher G, Kerr PG, et.al. Predictors of Health-Related Quality of Life in Patients with Co-Morbid Diabetes and Chronic Kidney Disease. *POLS One*. 2016; **19**; 11(12).

18. Aggarwal HK, Jain D, Pawar S, Yadav RK. Health-related quality of life in different stages of chronic kidney disease. *QJM*. 2016; **109**:711-16.

19. Masina T, Chimera B, Kamponda M, Dreyer G. Health related quality of life in patients with end stage kidney disease treated with haemodialysis in Malawi: a cross sectional study. *BMC Nephrol.*2016; **17**:61.

20. Osthus TB, von der Lippe N, Ribu L, Rustøen T, Leivestad T, Dammen T, et al. Health-related quality of life and all-cause mortality in patients with diabetes on dialysis. *BMC Nephrol.* 2012; **13**:78.

21. Mittal SK, Ahern L, Flaster E, Maesaka JK, Fishbane S. Self-assessed physical and mental function of haemodialysis patients. *Nephrol Dial Transplant.* 2001; **16**:1387-94.

22. Perales Montilla CM, Duschek S, Reyes Del Paso GA. Quality of life related to health chronic kidney disease: Predictive importance of mood and somatic symptoms. *Nefrologia*. 2016; **36**:275-82.

23. Kent S, Schlackow I, Lozano-Kühne J, Reith C, Emberson J, Haynes R et al. What is the impact of chronic kidney disease stage and cardiovascular disease on the annual cost of hospital care in moderate-to-severe kidney disease? BMC Nephrol. 2015; **16**:65.

24. Ikonomou M, Skapinakis P, Balafa O, Eleftheroudi M, Damigos D, Siamopoulos KC. The impact of socioeconomic factors on quality of life of patients with chronic kidney disease in Greece. *J Ren Care. 2015;* **41**:239-46.

25. Jansen MA, Korevaar JC, Dekker FW, Jager KJ, Boeschoten EW, Krediet RT, et al. Renal function and nutritional status at the start of chronic dialysis treatment. *J Am Soc Nephrol*. 2001; **12**:157-63.

26. Sharma RK, Sahu KM. Nutrition in dialysis patients. J Indian Med Assoc. 2001 Apr, 99(4): 206-8, 210- 1,213

27. Kopple JD. Therapeutic approached to malnutrition in chronic dialysis patients: the different modalities of nutritional support. Am J Kidney Dis. 1999. Jan 33 (1): 180-5

28. Bossola M, Tazza L, Giungi S, Rosa F, Luciani G. Artificial nutritional support in chronic hemodialysis patients: a narrative review. J Ren Nutr. 2010 Jul, 20 (4): 213-23

29. Bossola M, Muscaritoli M, Tazza L, Giungi S, Tortorelli A, Rossi Fanelli F, Luciani G. Malnutrition in hemodialysis patients: what therapy? Am J Kidney Dis. 2005 Sep, 46 (3) 371-86

30. Van Loon IN, Bots ML, Boereboom FTJ, Grooteman MPC, Blankestijn PJ, Van Den Dorpel MA et al. Quality of life as indicator of poor outcome in hemodialysis: relation with mortality in different age groups. BMC Nephrol. 2017; **18**: 217

31. U.S. Renal Data System, USRDS 2013 Annual Data Report: Atlas of End-Stage Renal Disease in the United States, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2014. [Updated: Feb 2, 2016; cited 2018 October 29th] Available from: https://pharm.ucsf.edu/kidney/news-