ORIGINAL ARTICLE

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

PR Prout[1], SD Nichols[1]

ABSTRACT

Objective: *The purpose of this study was to determine health-related quality of life and the risk of malnutrition among persons with chronic kidney disease on maintenance haemodialysis (MHD).*

Methods: *A mixed-methods approach consisting of a case-control study followed by detailed interviews was employed. Cases (MHD) received haemodialysis three times per week. Controls (non-MHD) 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 12-Item Short Form Survey and mini-nutritional assessment questionnaire as well as socio-demographic, health-related symptoms, food frequency and physical activity. Anthropometry was assessed using standard procedures. Sixty participants completed the questionnaires on two occasions, 8-weeks apart. The study was approved by The University of the West Indies Ethics Committee.*

Results: *Four hundred and seventy-three persons (MHD = 150; non-MHD =323) participated in the study. The test–retest reliabilities differed by sex and treatment status. Mental component summary score (MCS) and physical component score (PCS) test–retest reliabilities (Cronbach's alpha) for female MHD were 0.75 and 0.68, respectively, while they were 0.5 and 0.53, respectively, for male MHD. There were no significant differences in age, body mass index and sex between MHD and non-MHD. Maintenance haemodialysis participants were more likely than non-MHD to be at increased risk for poorer HRQOL and malnutrition. Mini-nutritional assessment tool scores were positively associated with PCS (*p *= 0.025) and MCS (*p *= 0.002) scores in multivariate regression analyses controlling for age, gender, ethnicity, education, employment, income and comorbidities.*

Conclusion: *Maintenance haemodialysis participants had poorer health-related quality-of-life and were at higher risk of malnutrition than non-MHD.*

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

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

From: [1]Nutirtion Group, Department of Agricultural Economics & Extension, The University of The West Indies-St. Augustine, St. Augustine, Trinidad and Tobago.

Correspondence: Ms PR Prout, The University of the West Indies-St. Augustine, St. Augustine, Trinidad and Tobago.
Email: patricerp@gmail.com

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 CKD on maintenance haemodialysis (MHD).

SUBJECTS AND METHODS

This study employed a mixed-methods approach; a case–control study followed by detailed interviews of participants was 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–December 31 2016. Prior to enrolment, they were informed of the nature of the study. All consents were witnessed by members of the various health-care 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 socio-demographic, 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 occasions 8-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), bodily 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 scores (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 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 on 60 participants (MHD = 20; non-MHD = 40). These were put into themes and important issues categorized.

Statistics

Data were analysed using SPSS version 23 (Chicago, IL, USA). Prior to analyses, data were inspected for errors and required changes made. Physical component and mental component summary scores less than 40 and 45, respectively, were categorized as increased risk of poor HRQOL in these domains (14, 15). Participants with MNA scores less than 8 were considered to be at increased risk for malnutrition. Similarly, qualitative data were coded and categorized by themes relevant to HRQOL issues. Differences in means of continuous variables between MHD groups were analysed using the *t*-tests and its non-parametric equivalent, the Mann–Whitney *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's alpha (16). Cronbach's alpha values greater than 0.7 were considered acceptable. Finally, p-values < 0.05 were considered statistically significant.

RESULTS

The test–retest reliabilities differed by sex among MHD status. Mental component and physical component summary scores' 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 MHD status. There were no significant differences in age, sex, ethnicity, education and anthropometry between MHD and non-MHD. Maintenance haemodialysis participants were more likely to be persons of East Indian descent, while non-MHD participants were more likely to be persons of African descent. Non-MHD participants were significantly heavier and more active than MHD. They were also at lower risk for undernutrition. 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, 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. Maintenance haemodialysis participants were significantly more likely than non-MHD to be at increased risk of malnutrition (62.0% vs. 38.0%; p

Table 1: Socio-demographic, anthropometric and lifestyle behaviours of participants by haemodialysis status

Variables	Haemodialysis n = 150 Mean ± SD	Non-haemodialysis n = 323 Mean ± SD	*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

SD = standard deviation; BMI = body mass index; MNA = Mini-Nutrition Assessment.

= < 0.001). In multivariate regression analyses controlling for age, gender, ethnicity, education, employment, income and comorbidities, MNA scores were positively associated with PCS (p = 0.025) and MCS (p = 0.002) scores.

Table 2. SF-12 subscales and summary scores among participants by maintenance haemodialysis status

Variables	Haemodialysis n = 150 (Mean ± SE)	Non-haemodialysis 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

SD = standard deviation; SE= standard error.

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

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

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

Variables	Haemodialysis n = 150 (Mean ± SE)	Non-haemodialysis 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 (MH)	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

HRQOL = health-related quality of life; SE = standard error; CI = confidence interval.

Results of qualitative analyses indicate the MHD participants were significantly more likely than non-MHD to report psychological/emotional stress related to: routine daily tasks (60% vs. 33%; $p = 0.04$), 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 on haemodialysis experienced poorer HRQOL 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 comorbidities, diabetes mellitus and hypertension (18, 19). This is important as poor HRQOL is an important predictor of disease outcomes among persons receiving MHD (20). Factors leading to poor HRQOL among persons on MHD include fatigue, frailty, impaired mobility and 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 MHD that created anxiety included inability to effectively manage 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, socioeconomic issues that affect financial security were important sources of anxiety and poor mental health among MHD (24).

Although there were no statistically significant differences in anthropometry between MHD and non-MHD, nutrition is known to play 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). In fact, our results suggest that participants on MHD were at greater risk of malnutrition compared to their non-MHD counterparts. This may have been exacerbated by poor appetite associated with depression, difficulty chewing and mandatory dietary restrictions (21–23).

Limitation

We did not evaluate biochemical 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-randomized sampling of participants reduces generalization of these findings to local and regional populations of persons receiving haemodialysis (22). The lower Cronbach's alpha values among males may reflect a progressive worsening of their PF. In fact, males formed the majority of deaths in this cohort over the past 2 years.

CONCLUSION

Chronic kidney disease patients on MHD were at increased risk of 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. [Accessed on November 13th 2017]. Available from: http://global-disease-burden.healthgrove.com/l/67192/Chronic-Kidney-Disease-in-Trinidad-and-Tobago..
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, C Paik. Statistical methods for rates and proportions. New Jersey: Wiley, 2003.
10. Sullivan MK, Dean AG., Mir AR. OpenEpi—Sample Size for Unmatched Case-Control Studies. [Accessed May 2016]. Available from: http://www.openepi.com/SampleSize/SSCC.htm
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:** 782–8.
13. Lohman TG, Roche AF, Martorell R eds. Anthropometric standardization reference manual. Champaign, IL: 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. [Cited 24 May 2018]. Available from: https://www.researchgate.net
16. WHAT DOES CRONBACH'S ALPHA MEAN? SPSS FAQ. [Cited 24 May 2018] Available from: https://stats.idre.ucla.edu/spss/faq/what-does-cronbachs-alpha-mean/
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. PLoS One. 2016; **19:** 11.
18. Aggarwal HK, Jain D, Pawar S, Yadav RK. Health-related quality of life in different stages of chronic kidney disease. QJM. 2016; **109:** 711–6.
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.

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