**A Comparison of Quality of Life in Haemodialysis and Peritoneal
Dialysis Patients**

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Abstract:

Decreased quality of life of end-stage renal disease is further compromised by renal function replacement treatments such as haemodialysis (HD) and peritoneal dialysis (PD). Poor quality of life negatively affects treatment outcome. This study compared quality of life between HD and PD patients. Quality of life in 15 HD and 15 PD patients at a South African renal unit was compared using the SF-36 short form. There was no significant difference between HD and PD patients for total SF-36 score, but HD subjects reported more pain. Quality of life is similar in HD and PD patients, with the exception of higher pain levels in HD patients.

Key terms: quality of life, dialysis, mental health, physical health

Introduction

End-stage renal disease (ESRD) has emerged as a major international public health concern (Venkat, Kauffman & Venkat, 2006). With the estimated incidence of ESRD in South Africa at approximately 400 per million people and the number of patients presenting with chronic renal disease in South Africa continually on the rise, the burden of ESRD on the country is alarming (Katz, 2005; Moosa & Kidd, 2006). Ideally, renal transplantation would be the treatment of choice for ESRD. Unfortunately, due to the lack of organ donation, dialysis treatment in the form of haemodialysis (HD) and peritoneal dialysis (PD) constitute the bulk of the renal replacement treatment (Schena, 2000). HD has been available at medical institutions since the 1960's and relates to the removal of waste products from the blood via an artificial kidney (Quinton, 1960). This form of treatment can be undertaken by the patient either at home or at a dialysis care unit such as a designated hospital ward (de Wit, Ramsteijn & de Charro 1998). PD, on the other hand, encompasses the elimination of waste products by removal of unwanted substances from the blood circulation across the patient's peritoneal membrane.

The South African setting. South Africa's public health-care system serves approximately 80% of the population. Yet, only 40% of the total health-care expenditure is directed to the public system (Anonymous, 2008). This has dire implications for treatment of chronic conditions such as ESRD, especially with the prevalence of ESRD set to rise by as much as 130% in Africa by 2020 (Katz, 2005).

Furthermore, the annual cost of renal dialysis is high in developing countries such as South Africa (Dirks & Levin, 2006). High costs combined with the lack of resources, has meant that rationing of dialysis is common practice (Moosa & Kidd, 2006). Katz (2005) estimates that there should be roughly 16 000 ESRD patients on renal replacement therapy in South Africa, but that a sizeable number of patients dies without receiving renal replacement therapy. Given the limited access to renal replacement therapy, due largely to a shortage of facilities and high costs, it is prudent to examine the factors that may decrease the efficiency of treatment. Some of these factors are included in the study of quality of life.

Quality of life of haemodialysis (HD) and peritoneal dialysis (PD) patients.

While the effects of the ESRD on its own are pervasive, the effects of dialysis treatment may prompt further physical and psychological distress for many patients. The burden of illness is therefore not confined to the physical impact of ESRD but encompasses the effects of treatment. The consequences of increasingly poor psychological well-being, superimposed on physical deterioration, may be far-reaching. Renal patients have shown poorer quality of life outcomes than the general population and compare negatively with most other medical patients (Caress, Luker, & Ackrill, 1999).

Quality of life is broadly defined as a person's sense of well being and ability to function productively in daily life (Williams, 1998). Mental health problems

such as depression are often undetected and therefore untreated in dialysis patients, resulting in further diminished quality of life for the patient (Drayer, *et al.*, 2006). Some of the physical variables known to influence the quality of life of dialysis patients include years on dialysis treatment (Baiardi, *et al.*, 2002), age (Baiardi 2002), dialysis inadequacy and, by implication, the extent of accumulation of uraemic toxins (Horl, 1998; Kinchen, 2001), nutritional status and the haemoglobin concentration (Baiardi 2002; Platinga, 2007).

While it is generally accepted that both HD and PD negatively impact the quality of life, it still remains disputed whether a significant difference exists between the quality of life of patients on HD and those on PD. It is often assumed that patients on PD are better off than those on HD and some of the advantages described for PD above that of HD are the assumption of better prevention of hepatitis C, better management of anaemia, lower costs and - perhaps most importantly - more freedom (Pucheu, *et al.*, 2004; Blake, 2001). However, the failure rate with regards to technical aspects is often higher in PD, which then necessitates initiation of HD (Blake, 2001). The studies of Wu, *et al.* (2004) and Kontodimopoulos and Niakas, (2008) support the perception that the quality of life for PD patients is better than that of HD patients. In contrast Wasserfallen, *et al.* (2004), Killingworth and Van den Akker (1996) and Jager (2004), found the quality of life to be equally reduced in HD and PD patients. Low quality of life in these patient groups was attributed mainly to experiences of pain/discomfort and anxiety/depression.

Goals of the study. Given the lack of consensus in the literature, more information is required regarding the quality of life of renal dialysis patients. This study aims to compare the two groups of dialysis patients in terms of their quality of life, as assessed by the Medical Outcomes Short Form (SF-36).

Research questions:

- Is there a difference in the quality of life between HD and PD patients?
- Is there a relationship between quality of life and physiological measures such as urea, haemoglobin and albumin levels in HD and PD patients?

Method

Participants and setting. Patients were recruited from a tertiary academic teaching hospital in Tshwane, South Africa. All patients undergoing dialysis were invited to participate in the study. Those that volunteered for the study (N=55) were required to give written consent with the understanding that they could withdraw their participation at any time. From the total of 32 HD patients, 15 gave their consent. Consent was also obtained from 15 out of the total of 23 PD patients. Questionnaires were completed during the patients' scheduled visits to the hospital. HD patients underwent dialysis treatment three times a week on either Mondays/Wednesdays/Fridays or

Tuesdays/Thursdays/Saturdays. Patients completed the questionnaires at the initiation of their HD session (three to four hours). PD patients were scheduled to visit the ward once every month and the questionnaires were conducted on the day of each patient's hospital visit.

Instrument. We used the SF-36 (Ware 2008) to measure quality of life in patients. The SF-36 is a commonly used measure in quality of life studies (Maor, King, Omer & Mozes, 2001). It is a 36-item based questionnaire, which assesses the quality of life outcomes of individuals along two main components, namely physical health and mental health. These components are subdivided into eight categories, which involve questions based on the individual's perception of his/her own health with regards to physical bodily pain and emotional functioning (Ware & Sharebourne, 1992). The instrument subcategories for mental health refer to the evaluation of vitality, social functioning, emotional roles and emotional aspects, while the physical health subcategories are physical functioning, physical roles, bodily pain and general health.

The SF-36 was designed as a survey for use in clinical practice, research, health policy generation and for the general population. The questionnaire can be self-administered by individuals of 14 years and older (Ware, Keller &

Gandek, 1995). The SF-36 is one of the few generic instruments for the determination of quality of life that has been tested for reliability, validity and responsiveness in the ESRD population (Cagney, 2000). Reliability of the SF-36 test is high with all dimensions, except that of social functioning, exhibiting Cronbach's alpha scores greater than 0.85 (Brazier, Harper & Jones, 1992). The validity and reliability of the test has been established in studies of a Chinese general population (Lam, Tse, Gandek & Fong, 2005) and a Swedish general population (Sullivan, Karlsson & Ware, 1995). The test has been used to examine the health status of various medical subjects, such as chronic fatigue syndrome (Komaroff, *et al.*, 1996) and has on occasion been used to monitor and improve the care of patients in renal units (Kinchen, 2001)

Table 1 provides a summary of the domains of the SF-36. The meaning of the high and low scores for the domains is also indicated. The means and standard deviations are derived from a survey of the general US population collated by Ware (2008).

Physiological parameters

Bloods for the determination of the subjects' urea, albumin and haemoglobin levels were collected on days scheduled for treatment. These were sent to the hospital's core laboratory for analysis.

Procedure. Information about the study protocol was presented to the dialysis staff prior to commencement of the study. The patients undertook the SF-36 with the assistance of the dialysis nursing sister where necessary. Ethical clearance was obtained from the Faculty of Health Sciences Research and Ethics Committee of the University of Pretoria. The clearance number was S168/2006.

Data Analysis. The SF-36 scores for the HD and PD patients were compared to each other using Mann-Whitney U test of differences between ranks (BMDP Statistical Software, Inc.). Statistical inference for the analysis was performed using correction for non-parametric distribution of data with p-values of < 0.05 considered statistically significant. In addition to this analysis, the scores of the scales were compared with respect to age, number of years on treatment and physiological variables.

Results

The mean age and years of treatment for each of the two groups are delineated in Table 2. Differences in age and years on treatment were statistically non-significant ($p=0.469$ and $p=0.344$, respectively).

Differences in Quality of Life in HD and PD Patients

Table 3 shows the results of SF-36 for the HD and then PD groups. The HD patients had a mean SF-36 score, which was 109.360 (SD=10.659) or 59.4 %

of the total possible score. PD patients had a mean SF-36 score of 105.600 (SD=4.939) or 57.4 % of the total possible score. A t-test indicated non-significant differences between the groups in terms of overall SF-36 scores ($p=0.244$) and this was confirmed by the Mann-Whitney test ($p=0.497$).

Comparison of Quality of Life with Reference Populations

In terms of norm-base scoring we transformed the scores using a T-score scaling (mean=50, standard deviation=10) (Ware & Sherebourne, 1992). These scores can then be compared to various referenced populations, such as the American population, asthma sufferers, and that of others. Figure 1 summarises the norm-based score distribution of the eight aspects measured by the SF-36. The only significant norm-based score difference between the HD and PD patients was found in the bodily pain (BP) category ($p<0.05$). The degree of bodily pain reported by HD patients was therefore significantly higher than that reported by the PD patients. A comparison was also drawn between the two groups and the scores for the general adult American population (Ware, 2008). There was no statistically significant difference for either patient group *versus* the American data when comparing each of the eight aspects.

The statistical analysis results for correlations between the test scores of the SF-36 and patient demographics (age and number of years on treatment) yielded correlation coefficients of $r < 0.5$ with no statistically significant results.

Physiological Measure Comparisons

Table 4 indicates the urea, albumin and haemoglobin results for the two patient groups. Mann-Whitney U test statistics indicated no significant difference in urea ($p=0.3837$) and albumin ($p=0.2339$) between the HD and PD groups. There was however, a statistically significant difference in haemoglobin ($p=0.0107$) between the HD and PD groups.

The mean total SF-36 scores of the two patient groups were correlated to urea, albumin and haemoglobin levels using Spearman correlation coefficients. There were no statistically significant correlations in these data. These results are reflected in Table 5.

Discussion

The 36-Item Short-Form Health Survey (SF-36) was used to ascertain the quality of life of HD and PD patients in terms of functional health and well-being and to explore whether any differences exist between patients on HD and patients on PD treatment. It is generally known, and could be expected, that quality of life declines in conditions of end stage chronic renal failure. Although renal replacement therapies such as HD and PD are able to correct some of the homeostatic disturbances and thereby alleviate some of the physical problems, these treatments have potential physical and psychosocial disadvantages, including the time consumed by treatment in hospitals or clinics and the pain associated with treatment. In general, life of end stage chronic renal failure patients on renal function replacement treatments is negatively influenced by the physical symptoms of the disease, as well as by

physical and psychosocial aspects of the treatment itself (Kimmel, 2001). The majority of these patients suffer severe disturbances of their normal life styles, including disturbances in their careers and their regular roles in family life, a decline in financial stability, a decline in physical and cognitive abilities, depression and, generally, a loss of autonomy (Kimmel, 2002; Kimmel 2001; Kimmel, 1993).

There is still disagreement about the comparative quality of life between HD and PD patients. A small number of studies has been done on this aspect with each study usually, but not always, confined to a specific centre. Reports from different centres vary with some finding no difference (Jager, 2004), some reporting a better quality of life in patients on HD (Koorevaar, 2003) and others finding PD patients to have a better quality of life (Wu, 2004).

In this study quality of life, as reflected by the SF-36 scores, was similar for HD and PD patients. There was thus no significant difference in overall quality of life, as indicated by the SF-36 score. This supports the findings of one of the largest studies abroad (Kutner, 2005) in which quality of life was compared between HD and PD patients.

The two groups investigated in this study were similar with regards to several of the factors known to influence the quality of life: albumin levels – which are often an indication of nutritional status or plasma urea concentration – an indication of dialysis adequacy. The only significant difference between the

two groups was the haemoglobin concentrations. Several researchers have previously noted quality of life in dialysis patients to improve with increases in haemoglobin concentrations (Platinga, 2007). In fact, the degree of anaemia in end stage renal failure is described as an important health outcome measure and has been found to correlate with other clinical symptoms (Kinchen, 2001). In this study, feasible explanation for the lack of significant overall quality of life difference across the two groups, despite significant differences in haemoglobin concentrations, can probably be found in the fact that both groups were overtly anaemic and that the haemoglobin levels of both groups were significantly lower than normal (Kausz, 2000). In fact, both the HD and PD groups had haemoglobin levels below the current minimum guideline for haemoglobin concentrations in dialysis patients (11 g/dl) (Platinga, 2007).

The scores of the two treatment groups were compared for each of the eight aspects measured by the SF-36, namely: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional and mental health. The only significant difference was found for bodily pain where the PD patients scored significantly lower than HD patients. Bodily pain has previously been found to be one of the factors to impact significantly on the quality of life of dialysis patients (Baiardi 2002). There are indeed many factors that can lead to either acute or chronic pain in patients on HD, as well as in patients on PD. It would, however, be speculative to come to any kind of conclusion about the reasons for the differences in body pain found between

the two groups in this study. The indication does, nonetheless, warrant a separate study with the focus on body pain due to the fact that no such studies could be found in literature. This is of particular importance in view of the fact that pain (in end-stage chronic renal failure patients on dialysis, as well as in the population in general) is a major confounder of the quality of life, while quality of life is in turn known to be a major determinant of health outcome in end-stage renal failure patients (Kinchin, 2001).

Conclusion

This study compared the quality of life in end stage chronic renal failure patients on HD and on PD in a renal unit in Tshwane, South Africa. The results indicate quality of life to be similar in HD and PD patients. However, haemoglobin levels and bodily pain differed significantly across the groups and warrant further scrutiny as possible detractors in the quality of life in ESRD patients on dialysis. The reliability of this study is limited by the sample size and the recruitment of patients from a single renal unit. Future studies should include larger patient groups from different dialysis units in South Africa.

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Table 1 Summary of the SF-36 domains and mean values according to the US general population survey (adapted from Ware, 2008).

Component	Subscale	Low score	High score	Mean	SD
Physical health (mean = 50; SD = 10)	Physical functioning (PF)	Very limited in performing physical activities	Performs all physical activities with vigour and without limitation	84.2	23.3
	Role-physical (RP)	Problems with work and other roles because of physical illness	No problems with daily activities, including work	80.9	34.0
	Bodily pain (BP)	Very severe pain experienced which limits physical activity	No pain or limitations due to pain	75.2	23.7
	General health (GH)	Perceives personal health as poor and believes it will worsen	Perceives personal health as excellent	71.9	20.3
Mental health (mean = 50; SD = 10)	Vitality (VT)	Feels tired and worn out all the time	Experiences pep and energy all the time	60.9	20.9
	Social functioning (SF)	Extreme and frequent limitation of normal social activities because of physical or emotional problems	Performs normal social activities without limitations because of physical or emotional problems	83.3	22.7
	Role-emotional (RE)	Problems with work and other roles because of emotional illness	No problems with daily activities, including work	81.3	33.0
	Mental health (MH)	Feels nervous and depressed all of the time	Experiences peace, calm and happiness all the time	74.7	18.1

Table 2 Mean age and years of treatment for the two patient groups

Patient Group	#	Mean age in years	SD age	Age Distribution	* Average Years on Treatment (SD)	Years on Treatment (range)	Gender Distribution			
							Male		Female	
							n	%	n	%
HD (n=15)		39.9	9.98	24 - 57	5.8 (5.540)	1 - 22	11	73.3	4	26.7
PD (n=15)		36.9	11.8	19 - 57	4.3 (2.320)	2 - 8	8	53.3	7	46.7
Statistical Analysis of differences between patient groups: #p= 0.469 ; *p = 0.344										

Table 3 SF36 data for HD and PD patient groups.

SF-36 Scoring	n	Mean	SD	Range	Median	SEM
* # HD	15	109.360	10.659	95 – 125	110	2.849
* # PD	15	105.600	4.939	99 – 116	105	1.275
Test statistics for * Separate T: p = 0.244 and # Mann-Whitney: p= 0.497						

Table 4 Urea, albumin and haemoglobin values for the HD and PD groups. * indicates significant difference ($p < 0.05$)

HD patients			
	Urea (mmol/L)	Albumin (g/L)	Hb (g/dL)
Mean	27.74	33.07	* 8.97
SD	7.32	2.84	2.05
PD patients			
	Urea (mmol/L)	Albumin (g/L)	Hb (g/dL)
Mean	25.22	30.6	* 10.66
SD	11.10	5.35	1.79

Table 5 Correlation coefficients between the SF-36 overall scores and mean urea, albumin and haemoglobin

Serum measure	SF-36 overall score correlation (r) with serum	P-value
Urea	-0.02	0.93
Albumin	-0.44	0.103
Haemoglobin	-0.39	0.15

Figure 1 SF-36 Measurement Model for HD patients, PD patients and US normal based control population. Error bars indicate standard deviations.