

QUALITY OF LIFE OF CHRONIC DIALYSIS PATIENTS

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Declaration

Declaration with regard to independent work:

I, CHEVON LEE CLARK, identity number [REDACTED] and student number 9907726, hereby declare that this research project submitted to the Central University of Technology, Free State for the degree DOCTORATE TECHNOLOGIAE: CLINICAL TECHNOLOGY (NEPHROLOGY), is my own independent work; and complies with the Code of Academic Integrity, as well as relevant policies, procedures, rules and regulations of the Central University of Technology, Free State; and has not been submitted before to any institution by myself or any other person in fulfilment (or partial fulfilment) of the requirements for the attainment of any qualification.



01/11/2013

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List of abbreviations

Abbreviation	Term
AKI	Acute kidney injury
APD	Automated peritoneal dialysis
APKD	Adult polycystic kidney disease
BDI	Beck depression inventory
BP	Blood pressure
BP	Bodily pain
CAPD	Continuous ambulatory peritoneal dialysis
CDI	Cognitive depression index
CDQOLS	Chinese dialysis quality of life scale
CKD	Chronic kidney disease
CKD-MBD	Chronic kidney disease: mineral bone disorder
CMS	Centre for Medicare and Medicaid services
CV	Cardiovascular disease
dL	Decilitre
DOPPS	Dialysis outcomes and practice patterns study
ESA	Erythropoiesis stimulation agents
ESKD	End stage kidney disease
EQ-5D	Euro quality of life – 5 dimensions
FGF-23	Fibroblast growth factor 23
FLZ	Life satisfaction score

Abbreviation	Term
g	Gram
GDP	Gross Domestic Product
GFR	Glomerular filtration rate
GH	General Health
HD	Haemodialysis
HEMO	Haemodialysis study
HIV	Human Immunodeficiency Virus
HNHD	Home nocturnal haemodialysis
HRQOL	Health-related quality of life
IEF	Illness effects questionnaire
IHD	Intermittent haemodialysis
ISRNM	International Society of Renal Nutrition and Metabolism
KDIGO	Kidney Disease: Improving global outcomes
KDOQI	Kidney disease outcomes quality initiative
KDQOL-SF™	Kidney disease quality of life short form
Km	Kilometres
Kt/V	Clearance x time / Volume
L	Litre
m	Metre
MBD	Mineral bone disorder
MCS	Mental component summary / Mental composite score
mg	Milligram
MH	Mental health

Abbreviation	Term
min	Minute
mL	Millilitres
mmHg	Millimetre of mercury
mmol	Millimoles
MOS	Medical outcomes study
MRC	Medical Research Council
N	Number
NECOSAD	Netherlands Cooperative Study on the Adequacy of Dialysis
Ng	Nanogram
NHI	National Health Insurance
NHP	Nottingham Health Profile
NKF	National Kidney Foundation
NRC	National Renal Care
PCS	Physical component summary / Physical composite score
PD	Peritoneal dialysis
PESKD	Pre-end stage kidney disease
PEW	Protein-energy wasting
PF	Physical functioning
Pg	Picogram
PLC	Quality of life profile for chronic disease
PMP	Per million population
PTH	Parathyroid hormone
QOL	Quality of life

Abbreviation	Term
QALI	Quality of American life
QALY	Quality-adjusted life-year
QLI	Quality of life index
RE	Role-emotional
RP	Role-physical
RRT	Renal replacement therapy
SARS	South African Renal Society
SADTR	Statistics of the South African Dialysis and Transplant Registry
SDHD	Short daily haemodialysis
SF	Social functioning
SF-12	Short-Form Health Survey – 12 item
SF-36	Short-Form Health Survey – 36 item
SIP	Sickness impact profile
SSA	Sub-Saharan Africa
TSAT	Transferrin saturation
UK	United Kingdom
US	United States
USA	United States of America
USD	United States dollar
USRDS	United States Renal Data System
VT	Vitality
WHO	World Health Organization
WHOQOL-BREF	World Health Organization Quality of Life-Bref

Definition of key terms

Burden of kidney disease

The burden of kidney disease in the quality of life survey is related to the time associated with dialysis, its invasiveness and burden on the family (Mazairac *et al.*, 2012).

Chronic kidney disease

Chronic kidney disease (CKD) is defined as kidney damage or decreased kidney function with a glomerular filtration rate $<60\text{mL}/\text{min}/1.73\text{m}^2$ for three months or more, irrespective of cause (Levey *et al.*, 2005).

“Kidney damage can be ascertained by the presence of albuminuria, defined as albumin-to-creatinine ratio $> 30\text{mg}/\text{g}$ in two of three spot urine specimens” (Levey *et al.*, 2005).

Dialysis

Dialysis refers to the diffusion of solutes across a semi-permeable membrane down a concentration gradient.

Dialysis removes nitrogenous (and other) waste products and corrects the electrolyte, water and acid – base abnormalities associated with kidney failure (Levy *et al.*, 2004).

It includes peritoneal dialysis (PD), haemodialysis (HD) and other forms of dialysis therapy (Daugirdas *et al.*, 2001).

Dialysis outcomes and practice patterns study

“The dialysis outcomes and practice patterns study (DOPPS) is an international prospective cohort study of a randomly selected group of more than 17 000 HD patients from the United States, five European countries and Japan” (Kimmel *et al.*, 2008).

Effect of kidney disease

The effect of kidney disease in the quality of life survey is related to the fluid and dietary compliance, the ability to travel and dependence of doctors (Mazairac *et al.*, 2012).

End stage kidney disease

End stage kidney disease (ESKD) is loss of kidney function requiring treatment with any form of renal replacement therapy, which includes dialysis or transplantation (Levy *et al.*, 2004).

Health-related quality of life

“The concept of health-related quality of life (HRQOL) pertains to health demands that are closely related to health or disease. These statistics are based on the World Health Organization (WHO) definition of quality of life (QOL) as a complete status of physical, mental and social well-being not merely absence of disease in infirmity” (Unruh, 2006).

Haemodialysis

This procedure makes use of a haemodialysis machine, which pumps your blood through a dialyser, which, via osmosis and diffusion across the dialyser, enables the removal of waste products and fluid from the body.

Peritoneal dialysis

“Peritoneal dialysis involves the transport of solutes and water across the peritoneal membrane that separates two fluid containing compartments. These two compartments are (a) the blood in the peritoneal capillaries, and (b) the dialysis solution in the peritoneal cavity. During the peritoneal dialysis dwell, three processes occur simultaneously: diffusion, ultrafiltration and absorption” (Daugirdas *et al.*, 2007).

Renal replacement therapy

The term renal replacement therapy (RRT) refers to transplantation or dialysis, which includes both peritoneal dialysis and hemodialysis used in the treatment of end stage kidney disease (Daugirdas *et al.*, 2007).

Symptom/problem list

The symptom/problem list in the quality of life survey is related to the presence of symptoms such as muscle cramps, pruritus, anorexia and/or access problems (Mazairac *et al.*, 2012).

Transplantation

Pre-emptive transplantation occurs when an individual receives a donated kidney prior to the commencement of dialysis.

Living donor transplantation occurs when an individual receives a kidney from a compatible living donor and in the case of a cadaver, the patient receives a kidney from an individual who is declared brain dead and their family members agree to donate their kidneys.

Abstract

Quality of life of chronic dialysis patients

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Objectives: Survival with end stage kidney disease (ESKD) is made possible by dialysis but is in turn associated with increased morbidity, mortality, and decreased quality of life (QOL). Quality of life is a frequently overlooked, yet a critical consideration in evaluating the overall medical care of ESKD patients. This study aimed to evaluate the QOL of chronic haemodialysis (HD) and peritoneal dialysis (PD) patients in multiple dialysis units in South Africa.

Methods: A comparative descriptive study carried out on 100 haemodialysis (HD) (n=100) and 100 peritoneal dialysis patients (PD) (n=100) patients, evaluating factors such as demographics, duration on dialysis, medical history, clinical indicators and the patient's understanding thereof, was performed. Quality of life was measured using the medical outcomes study 36 (SF-36). These factors, clinical scores and QOL measures were compared amongst HD and PD patients and thereafter correlated to nephrology professionals' perspective on QOL.

Results: A total of 200 (n=200) patients from 11 dialysis units were evaluated. Mean age for the HD group was 49±15 years compared to 53±14 years for the PD group (p=0.043). The HD patient group had an improved physical composite (PCS) score adjusted for age, urea, creatinine and albumin (p<0.001). The mental composite score (MCS) was improved in the PD group although not significant (p>0.05). A positive correlation was found, as PD patients had an improved symptom control score, adjusted for age (p=0.04), an improved effect of kidney disease score adjusted for albumin (p=0.000), and an improved burden QOL score adjusted for urea, creatinine and albumin (p=0.019). Age was shown to be associated to the physical functioning (p=0.01) and PCS (p=0.040), and diabetes to the emotional role (p=0.04), in QOL. An increase in the years on dialysis showed a reduced emotional well-being (p=0.028) and being on the transplant list an improved MCS (p=0.003). Participation in a pre-end stage kidney disease (PESKD) management programme showed improvement in the general health component (p=0.032), the effect (p=0.01), and the burden of kidney

disease ($p=0.02$). Assessing patients' knowledge on ESKD revealed the relationship of the PCS to the understanding of managing the complications associated with CKD ($p=0.01$) and access management ($p=0.01$). The understanding of diet was found to be significant to the burden of CKD ($p=0.01$) and the complications associated with CKD was found to be further significant to the effect and symptom QOL ($p=0.01$). Nephrology professionals rated the difficulty of living with kidney disease a 7.49 out of 10 score and 71% felt QOL is taken into consideration with managing ESKD patients.

Conclusion: The study demonstrated differences in the adjusted QOL scores amongst HD and PD dialysis patients in the dialysis units studied. The importance of PESKD was emphasized in relation to improved QOL. Quality of life is a valid marker and important for the ongoing audit of renal services.

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Chapter 1

Introduction

1.1 General background and problem statement

Chronic kidney disease (CKD) is not only a worldwide public health problem, but also a global socioeconomic concern with adverse outcomes including kidney failure, cardiovascular disease and premature death (Naicker, 2010). In Africa, chronic disease is reaching epidemic proportions with treatment for all beyond the reach for many African countries, leaving many individuals who need renal replacement therapy (RRT) without it (Naicker, 2010).

The rapidly increasing prevalence of chronic diseases, in conjunction with an ageing population, has become one of the important healthcare-related concerns in industrialised countries. End stage kidney disease (ESKD) is a paradigm chronic medical condition for several reasons. Its prevalence has been increasing steadily and it is predicted that it will continue to increase over the next decade (Mucsi *et al.*, 2008). Alongside the improvement of therapy and the improvement in dialysis survival, the known prevalence of ESKD continues to increase in most countries. It is higher than 2000 per million population (PMP) in Japan, approximately 1500 PMP in the United States, and in developing countries the figure varies from less than 100 PMP in Sub-Saharan Africa to 600 PMP in Saudi Arabia, despite similar rates of incidence in these countries and regions (Barsoum, 2006; Iseki, 2010).

Economic and manpower factors dictate a conservative approach to therapy in most instances in Sub-Saharan Africa. The majority of those with ESKD perish because of the lack of funds as very few can afford regular maintenance dialysis. Limitations to dialysis include the paucity of dialysis units, restriction of those units to urban areas, and the absence of sufficient government funding or subsidy and health insurance to cover the relatively high costs of dialysis (Bamgboye, 2003). Hospitals are grossly inadequate to take care of the vast populations who require care (Jha and Chugh, 2003).

Chronic kidney disease has further shown to affect every aspect of a person's life - their physical, mental and social health. It has been documented that the health-related quality of life (HRQOL) in dialysis patients is significantly impaired compared to the general population (Molsted *et al.*, 2007). Chronic kidney disease is therefore not only a public health issue but also a socioeconomic

problem and a source of disability (Santos *et al.*, 2009; Julian-Mauro *et al.*, 2012).

It has been clearly shown that quality of life (QOL) decreases with the progression of CKD stages and/or the presence of anaemia, malnutrition, or a history of cardiovascular disease (Tajima *et al.*, 2010). Further reports have shown a decline over time in QOL in peritoneal dialysis (PD) patients. As time passes patients are more burdened by their kidney disease, feeling more frustrated by the time spent dealing with their disease and the way it interferes with their lives. Patient satisfaction has shown to decline over time (Bakewell *et al.*, 2002).

Renal replacement therapies are miracles of medical technology and the ability of these technologies to sustain lives is of unquestioned significance. However, medical effectiveness is increasingly viewed from multiple perspectives that include more than survival rates and clinical outcome. Patients' functional status, well-being and satisfaction, along with treatment costs, also determine the effectiveness of care (Trbojevic *et al.*, 1998). Together with objective health measures, subjective rated HRQOL is important in the treatment evaluation of patients with chronic disease (Boini *et al.*, 2011).

According to the World Health Organization (WHO, 2009), health is defined as a "state of complete physical, psychosocial and social well-being and not merely the absence of disease or infirmity". The WHO (2009) further defines quality of life (QOL) as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns" (Finkelstein *et al.*, 2009). Health-related quality of life (HRQOL) is further defined by Finkelstein *et al.* (2009) as the extent to which one's usual or expected physical, social, or emotional well-being (quality of life) is affected by a medical condition and/or its treatment.

Quality of life must evolve from a multidimensional framework which includes physiological, psychological and social well-being as well as satisfaction as a central, core concept (Mapes *et al.*, 2003).

1.2 Purpose of the study

End stage kidney disease places an unaffordable financial burden on poor countries and RRT has a negative socio-psychological effect on communities. In most developing countries, the typical patient undergoing regular dialysis is only partially rehabilitated (Barsoum, 2006). Patients face many physical and emotional challenges as a result of their diagnosis and treatment-related side effects (Tong *et al.*, 2009).

The common goals have become to increase the quality and years of health and to eliminate the health disparities with the evidence of HRQOL declining over time and an increase in morbidity and mortality. Understanding the deterioration of HRQOL in increasing life expectancy is crucial given the ageing in the population and the burden and complexity of the disease (Lubetkin and Jia, 2009).

Survival is not all that matters, but rather comprehensive rehabilitation. This is especially important in developing countries where the onset of ESKD may be earlier and when people are younger. This is of great concern for the future incidence of ESKD in the developing world, where it is estimated that by 2030 more than 70% of ESKD will be residents of developing countries whose collective economies will account for less than 15% of the total world economy (Barsoum, 2006).

Therefore, it is critical that if a scarce lifesaving treatment such as dialysis is being offered that it is offered to fully rehabilitate a person and not partially rehabilitate him or her. The routine use of HRQOL assessment in the care of patients with CKD represents an important opportunity for healthcare providers. Patients' lives could be favourably influenced through the recognition of symptoms and psychological illness and impairments of physical functioning. Measuring and managing the aspects of QOL will lead to a more patient-centred care approach and improve the health and well-being among patients with CKD (Unruh, 2006).

Although numerous research papers have reported diminished QOL scores for ESKD patients (Dogan *et al.*, 2005; Lausevic *et al.*, 2007; Saban *et al.*, 2008; Finkelstein *et al.*, 2009), this study aims to report QOL of ESKD patients in a developing country - a developing country in which some dialysis is offered to those who can afford it and to a few selected patients in the public health sector.

The study further aims to view the relationship of the treatment modality to the HRQOL variables within a contextual framework of a developing country that rations dialysis and where many times patients are not given the choice of treatment but rather are dependent on the availability of resources and the maximum capacity offerings of units (Moosa and Kidd, 2006; Naicker, 2010). With the envisaged National Health Insurance (NHI) in South Africa aiming to provide quality care (Government Gazette, 2011), measuring and managing HRQOL will become pivotal in achieving this goal.

1.3 Aim of the study

The aim of the study was to evaluate the quality of life of chronic dialysis patients.

1.4 Objectives of the study

The objectives of the study were:

- To determine the relationship of socio-demographic and socio-economic characteristics, biochemical markers, a clinical analysis and quality of life in both haemodialysis and peritoneal dialysis patients.
- To identify modifiable factors associated with HRQOL amongst dialysis patients.
- To demonstrate the impact pre-end stage kidney disease management (PESKD) has on quality of life once dialysis has commenced.
- To investigate the impact of patient education on quality of life.
- To determine the patient's choice of dialysis and the relation to health-related quality of life.
- To assess the perspective of nephrology professionals against that of dialysis patients in respect to HRQOL parameters.

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Chapter 2

Literature review

2.1 Chronic kidney disease as a global socioeconomic concern

The epidemics of cardiovascular (CV) disease, obesity, diabetes, Human Immunodeficiency Virus (HIV), and cancer have all received enormous amounts of attention and awareness from the public, media and policy makers. By contrast chronic kidney disease (CKD) has largely remained a 'silent epidemic' and has often been referred to as the 'forgotten disease' (Stenvinkel, 2010; Katz *et al.*, 2011; Pozo *et al.*, 2012).

In many countries, CKD has reached epidemic proportions with 10 to 13% of the population in Taiwan, Iran, Japan, China, Canada, India and the United States of America (USA) showing signs of CKD as defined as albuminuria and/or decreased glomerular filtration rate (GFR) (Stenvinkel, 2010).

Failure to manage the high prevalence of risk factors associated with CKD such as diabetes, hypertension and obesity has resulted in a worldwide growth rate of 8% in end stage kidney disease (ESKD). This has translated into 1.4 million people receiving renal replacement therapy (RRT) (White *et al.*, 2008; Alashek *et al.*, 2012). The increase in the number of ESKD patients requiring RRT places an immense financial burden on countries as a result of the high costs associated with this life saving treatment (Barsoum, 2006).

Worldwide there is an increase in the length of time a patient will spend on dialysis. The morbidity and mortality of CKD has improved in recent years as a result of a greater understanding of its pathophysiology and an evidence-based approach to management (Safarinejad, 2009; Ng and Anpalahan, 2011). However the situation is aggravated by the shortage of organ donors and its impact on transplantation. It has become very important in this setting to understand and monitor the progression of quality of life (QOL) over time (Santos *et al.*, 2009).

This issue is particularly important in a developing country where spending limited health resources on expensive therapies like dialysis is a major issue (Santos *et al.*, 2009). In developing countries it is particularly important to get the best value for money spent, although this issue also holds true for developed countries.

Protagonists of nephrology in developing countries face challenges completely different from those of their peers practicing in the developed world. The constraints on capital and human resources combined with a rapidly escalating CKD burden places immense pressure on clinicians in developing countries, as described by Moosa and Kidd (2006).

In many developed countries dialysis is available to all in need of the procedure (White *et al.*, 2008; Stenvinkel, 2010). Approximately 80% of the world's RRT patients live in Europe, Japan or North America (White *et al.*, 2008). In the USA dialysis is federally funded and offers access to dialysis regardless of the patient's ability to pay. This alleviates the financial burden of the patient, yet the cost is a burden for the federal government, accounting for 27.6% of the total cost (Stenvinkel, 2010).

The access to RRT in poorer developing countries is mostly dependent on the healthcare expenditure and economic strength of the country (Barsoum, 2006). Survival is dependent on access being made available by the country's health service, as individuals are mostly unable to afford it and do not have medical insurance to support RRT. In India, only 10% of patients requiring dialysis receive it. Up to 70% of those patients commencing dialysis die or stop treatment within the first three months due to the costs involved. In South Africa, more than half of new ESKD patients are not offered RRT. Reasons in most situations are related to poverty, including unsuitable living conditions, unemployment and lack of education (White *et al.*, 2008).

It is difficult to accurately estimate the number of patients requiring dialysis in the developing world as a result of disorganised administrative structures to capture the data on the practice of dialysis. In South Africa there is no centralised system of health information, resulting in misleading and inaccurate statistical information (Jooste and Jasper, 2012). This fact reflects in the lack of renal registries (Jha and Chugh, 2003; White *et al.*, 2008). An example of this fact, highlighted by Naicker (2003), is that no reliable statistics exist for African countries regarding ESKD prevalence and dialysis rates. The statistics of the South African Dialysis and Transplant Registry (SADTR) reflects this further as they describe only patients selected for RRT and not the total population of people who have ESKD. The last reliable report of the SADTR in 1994 showed that 3399 patients (99 per million population [PMP]) were alive on treatment for end stage kidney failure (Naicker, 2003). In 2010 Naicker reported calculations suggesting that the incidence of CKD must be in the range of 200 to 300 PMP (Naicker, 2010).

The considerable difference between patients who have been diagnosed with ESKD and those who receive any form of RRT is

further reflected by the low dialysis rates of 20 PMP in Egypt, to 5 to 8 PMP in India and China, and even lower in other countries (Jha and Chugh, 2003). According to White *et al.* (2008), the global burden of ESKD is concealed behind statistics which reflect only the number of people treated, not those who die of kidney failure or cardiovascular complications. There is a large unmet need, particularly in developing countries.

Furthermore, 70% of the least developed countries are in Sub-Saharan Africa, with a gross domestic product per capita of less than \$1500; half the population live on less than \$1 per day and the per capita expenditure on healthcare ranges from \$9 to \$158, compared to > \$2000 in Europe. Although there may be variation in rates of kidney disease, there is variation due to limited economic capacity and the accuracy of figures may vary. As shown in Figure 2.1, a large number of people in low and middle income countries will die from kidney failure without receiving any treatment. Few developing countries are able to bear the cost of a dialysis programme and those that do ration this scarce resource (Moosa and Kidd, 2006; White *et al.*, 2008). The economic, human and technical resources required for long-term dialysis make it a major economic and political challenge (Jha and Chugh, 2003).

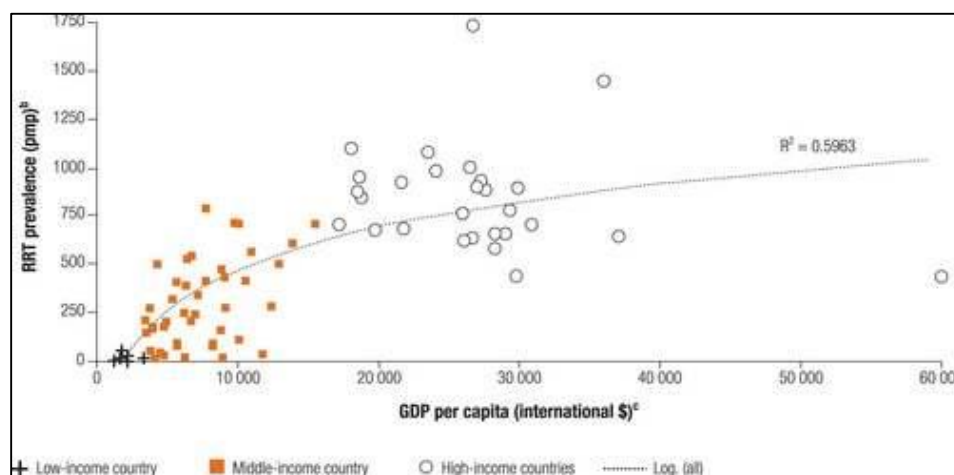


Figure 2.1 Prevalence of patients receiving renal replacement therapy, as at 31 December 2002, and gross domestic product per capita (White *et al.*, 2008).

Despite some awareness amongst health officials regarding the alarming data on the high worldwide CKD prevalence and huge impact on resources, it remains a low government priority (White *et al.*, 2008; Stenvinkel, 2010). Worldwide it is estimated that the cost of treating patients with ESKD exceeds one trillion United States dollars (USD) (Barsoum, 2006). Mortality rates are in excess of 20% per year, hospitalisations are more frequent and complicated,

resulting in the cost of care being disproportionately higher than the general population (Gorodetskaya *et al.*, 2005).

2.2 Achieving the best value for renal replacement therapy

In view of the great cost of RRT, and especially in developing countries, it can be strongly argued that the goal in providing RRT should not merely be to prolong life and maintain health, but to sustain QOL (Shu-Fen and I-Chuan, 2005; Moosa and Kidd, 2006). In fact, the two issues are not mutually exclusive. This is demonstrated in a study reported by Mapes *et al.* (2003) consisting of 1000 patients in the USA. Here they report an association between lower scores in the physical component of QOL and the higher risk of death and hospitalisation in the forthcoming 24 months. A larger study of 5256 patients at 243 dialysis facilities in the USA and Europe presented evidence that the mental components of QOL predict death and hospitalisation (Mapes *et al.*, 2003).

In the ideal situation, every ESKD patient should have access to dialysis. However, the reality is that there is not enough money for healthcare in the developing world, particularly for such an expensive and chronic treatment such as RRT, resulting in governments' and private health funders' reluctance to commit resources for dialysis (Bamgboye, 2003; Naicker, 2003).

Worldwide substantial diversity is seen in everyday clinical practice. Several studies suggest that the well-recognised mortality differences in haemodialysis (HD) populations may result from the divergent approaches to dialysis care. One of the main areas of divergence is the different degree of reliance on dialysis clearance and time when prescribing dialysis (Zsom *et al.*, 2008). An increase in frequency on dialysis and longer dialysis has shown to improve clinical outcome, as well as QOL (Kerr *et al.*, 2011; Lacson and Diaz-Buxo, 2011). However, those fortunate enough to have HD within a developing country are constrained to the 'minimum' four hour, three times a week schedule for the majority, with the minority having access to extended dialysis. This is due to limited resources and available funding for dialysis (Bamgboye, 2003; Naicker, 2010).

If RRT is being provided in a developing country then one should ensure it improves QOL and that the allocated resources are fully utilised and not used to partially rehabilitate patients. Providers of dialysis have a moral obligation to see to it that patients on dialysis experience a rewarding life that is worth living, even though it is limited when compared to the background population (Ritz, 2008). The South African Renal Society (SARS) has recognised the importance of achieving a minimum acceptable standard; therefore, implementing a regular evaluation in all units is considered

mandatory to achieve 'minimum' quality of care (Moosa and Kidd, 2006).

Quality of life is an essential component for any medical treatment and especially for one, as expensive as dialysis. This is even more important if one acknowledges that prevalence and costs of HD continues to escalate. It is in this context that an argument for accurate evaluation of treatment outcomes in CKD patients has become increasingly important; not only in terms of economic burden, but also in terms of how this complex chronic condition affects individuals' QOL and outcome (Saban *et al.*, 2008).

Impaired QOL may be a cause or a marker of developing cardiovascular disorders and other important outcomes, such as death and hospitalisation, as reported by Mapes *et al.* (2003). It is therefore critical to consider the quality of the remaining life years, along with the number of life years (Cleary, 2005).

2.3 Healthcare in South Africa

Recently there have been major advances in medicine and technology, particularly in RRT. However, many African countries, including South Africa (which is one of the wealthiest), are unable to introduce and sustain such miracles of technology and medicine. This is due to a myriad of enforced hardships, with scarce resources and established protocols accepting patients only without significant co-morbid disease at the core (Malanda, 2008; Katz *et al.*, 2011).

South Africa's health system is two-tiered. This is separated mainly by race and wealth. The private sector comprises 220 hospitals and serves approximately 9 million from the total 41 million population. Twenty-two percent of the population uses two-thirds of the nations estimated \$11-billion in healthcare spending, leaving the public sector with one third of the available funds for approximately 80% of the population (Bell, 1998). The public healthcare sector is under-resourced, relative to the size of the population that it takes care of, and the burden of disease, which has resulted in a healthcare system that is inequitable with the privileged few having disproportionate access to healthcare (Government Gazette, 2011).

Renal replacement therapy in South Africa is not freely available. Patients who can afford it or belong to a medical aid may be able to receive RRT therapies in the private sector, however, for the majority of South Africans this service is not available and is only provided to a minority group who fall within the inclusion criteria (Table 2.1).

Table 2.1 Renal assessment tool for the provision of renal replacement therapy (Okpechi *et al.*, 2012).

Category 1	Category 2	Category 3
Age <50 years	Age: 50-60 years	Age > 50 years
Body mass index <30	Body mass index: 30-35	Body mass index >35
Gainfully employed	Hypertension with target organ damage	Transplantation contraindicated or associated with unacceptable risk
HIV negative	Diabetes mellitus	HIV infection other than that described in category 2
Hepatitis B negative	Smoking	Active substance abuse
South African citizen	Hepatitis B or C positive (no cirrhosis)	Hepatitis B positive with cirrhosis
	HIV positive (CD4>200, undetectable viral load, on HAART)	Diabetes mellitus and age >50 years
	Late presentation needing urgent dialysis	Active uncontrolled malignancy with short life expectancy
	Co-morbid disease	Non-South African citizen
	Previous renal transplant	Advanced irreversible progressive vital organ disease
	Poor home circumstances	Mental illness resulting in diminished capacity to take responsibility for actions
	Convicted criminal for serious offence	Habitual non-adherence with any medical treatment
	Not gainfully employed	
	Poor social network / support	
	No proximity to dialysis unit	
Patients in category 1 must be accepted		
Patients in category 2 will be accepted depending on availability of space in the program and the number of factors in this category		
Patients in category 3 will be excluded		

In the public health sector, access may be limited by other factors besides economics which may include access e.g. distance from a dialysis service or even diagnostic limitations in rural areas (Table 2.1). Some patients within inclusion still are not offered RRT therapy, due to the limited availability of dialysis, which is defined by the institution, based on availability of funds, staff and equipment (Department of Health, 2009).

Section 27 of the Bill of Rights of the Constitution affirms that everyone has the right to have access to healthcare services (Dhai, 2012).

“It was over three decades ago that the signatories to the Alma-Ata Declaration described that all would contribute not only to a better quality of life but also to global peace and security. They gave acknowledgement to the fact that promoting and protecting health is essential not only for human welfare but also for sustained economic and social development” (Dhai, 2012).

South Africa spends 8.7% of its Gross Domestic Product (GDP) on health, which is more than any other African country, and the outcomes are poor (Keeton, 2010; Jooste and Jasper, 2012). The life expectancy in South Africa declined between 2009 and 2011 - from 53.5 to 52.4 years for males, and from 57.2 to 48.39 for females (Jooste and Jasper, 2012). Solutions are being developed and pursued (Malanda, 2008).

In August 2011 the Green Paper on the National Health Insurance (NHI) Scheme for South Africa was released. It is a step towards healthcare reform as embraced in the Constitution and a move towards the Alma-Ata’s health for all. The objectives of the NHI are shown in Table 2.2.

Table 2.2 Key goals of the National Health Insurance Scheme (Keeton, 2010).

- to provide universal coverage for all South Africans;
- to pool risks and funds;
- to improve negotiations with providers for supply of services and rational payment levels with quality assurance;
- to create one public fund with adequate reserves and funds for high-cost care;
- to promote efficient and effective service delivery in both public and private sectors; and
- to assure continuity and portability of national health insurance within the country.

The World Health Organization (WHO) has established three areas restricting countries from achieving universal coverage. The first is the availability of resources; even the wealthiest countries are not able to offer everyone access to all the available technology and procedures. The second area is reliance on direct payments at the time care is needed. Co-payments have resulted in many not receiving healthcare when needed and many have been driven into financial ruin and poverty. The third area is inefficient and inequitable use of resources. There is an estimated 20 to 40% wastage of healthcare resources. A fourth area, corruption, could be added to South Africa. Corruption is estimated to waste 10% of all health expenditure (Dhai, 2012).

However, as South Africa embarks on universal coverage for all, two areas remain a priority - reduction in healthcare costs and improving quality of care (Dhai, 2012).

To reduce the social and economic burden associated with maintenance RRT it is crucial that the aetiology of diseases that lead to kidney disease and prevent kidney disease should be determined (Safarinejad, 2009).

2.4 Pre-end stage kidney disease management

In South Africa pre-dialysis care is non-existent outside a few selected institutions. In many instances when detected early, as a result of economic constraints, the initiation of dialysis is delayed until the patient is in a state of advanced uraemia and has developed complications like hyperkalaemia, severe acidosis, pericarditis or encephalopathy (Jha and Chugh, 2003). Lack of resources have prevented detection and prevention of CKD, along with the ability of nephrological personnel to provide acute, chronic dialysis and transplantation (Naicker, 2010). Furthermore, in reality many patients will not have access to RRT, particularly in developing low-income countries, and therefore prevention should be the key objective (White *et al.*, 2008; Katz *et al.*, 2010).

The National Kidney Foundation's Kidney Disease Outcome Quality Initiative (KDOQI) has classified CKD into five stages (Table 2.3).

Table 2.3 Stages of chronic kidney disease as defined by KDOQI (2010).

Stage	GFR (mL min ⁻¹)	Description
1	>90	Kidney injury with normal GFR
2	60–89	Kidney injury with mild reduction in GFR
3	30–59	Kidney injury with moderate reduction in GFR
4	15–29	Kidney injury with severe reduction in GFR
5	<15	End-stage renal disease

(Stenvinkel, 2010)

Kidney disease is a high prevalence and low awareness condition (Chen *et al.*, 2010). It has been reported that over 19 million adults in the USA have some form of CKD (Levy *et al.*, 2009). The level of CKD awareness is low in both the general American population, reaching 24%, and among the high risk patients, there were less than 10% of individuals with stage 3 CKD who were aware of their disease (Safarinejad, 2009). Prevalence of CKD in Shanghai has been reported to be 11.8%, with an awareness of kidney disease within the CKD population of only 8.2% (Chen *et al.*, 2010). Safarinejad (2009) reports a 7.8% awareness level, with 2069 CKD, patients in Iran.

Chronic kidney disease has been described as the overt disease; the tip of an iceberg of covert disease (Barsoum, 2006; NKF, 2008). Kidney disease has reached epidemic proportion as it is estimated that 400 000 people are in stage 5, 400 000 in stage 4, 7 600 000 in stage 3, 5 300 000 in stage 2, and a further 5 900 000 in stage 1 in the USA alone (Figure 2.2) (NKF, 2008).

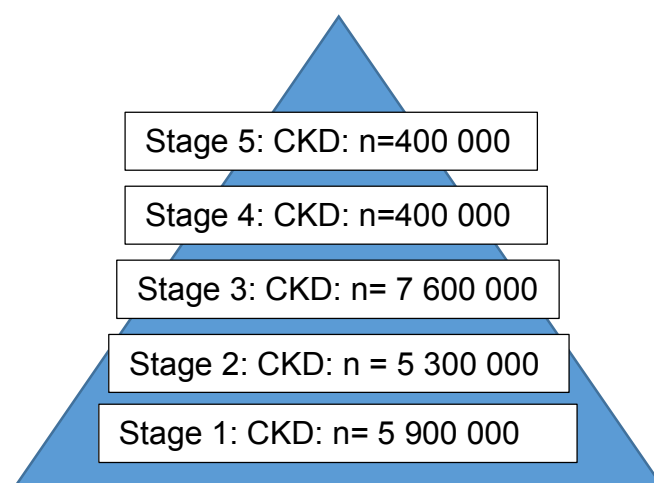


Figure 2.2 The prevalence of chronic kidney disease, according to the stage of kidney disease based on glomerular filtration rate (Barsoum, 2006; NKF, 2008).

The KDOQI evidence based clinical practice guidelines (2010) recommend routine screening of high risk individuals for CKD. Despite the recommendations, research has shown that high risk patients are not screened for CKD and the presence of CKD may go undiagnosed (Guessous *et al.*, 2009). In South Africa, as in many developing countries, screening programmes are either obsolete or serve the minority of the population (Bhimma *et al.*, 2008).

Early recognition is difficult due to the largely asymptomatic nature of CKD (Chen *et al.*, 2010). This has been shown by the number of patients who present to the nephrologist in kidney failure, less than 90 days before commencing dialysis (Mathew and Corso, 2009;

Stenvinkel, 2010). In South Africa socioeconomic, religious and cultural factors, along with high illiteracy levels, have shown to further contribute to the failure of patients being referred to tertiary centres for follow-up (Bhimma *et al.*, 2008). The United States Renal Data System (USRDS) reports 61% of HD and 73% of Peritoneal Dialysis (PD) patients were first seen by a nephrologist ≤ 3 months prior to onset of RRT. It was shown that these patients received inferior treatment with anaemia, lack of permanent vascular access, and thus at an increased risk of complications, morbidity and mortality, and increased cost (Wolfgang *et al.*, 2001; Bhimma *et al.*, 2008; Chen *et al.*, 2010). As shown in the diagram below (Figure: 2.3), leaving CKD untreated until symptomatic results in a lost opportunity for the prevention with antihypertensive medication, better glycaemic control, statins (Figure 2.3c), and lifestyle management (Figure 2.3b) such as weight loss, decreased fructose and salt intake, and stopping smoking (Stenvinkel, 2010).

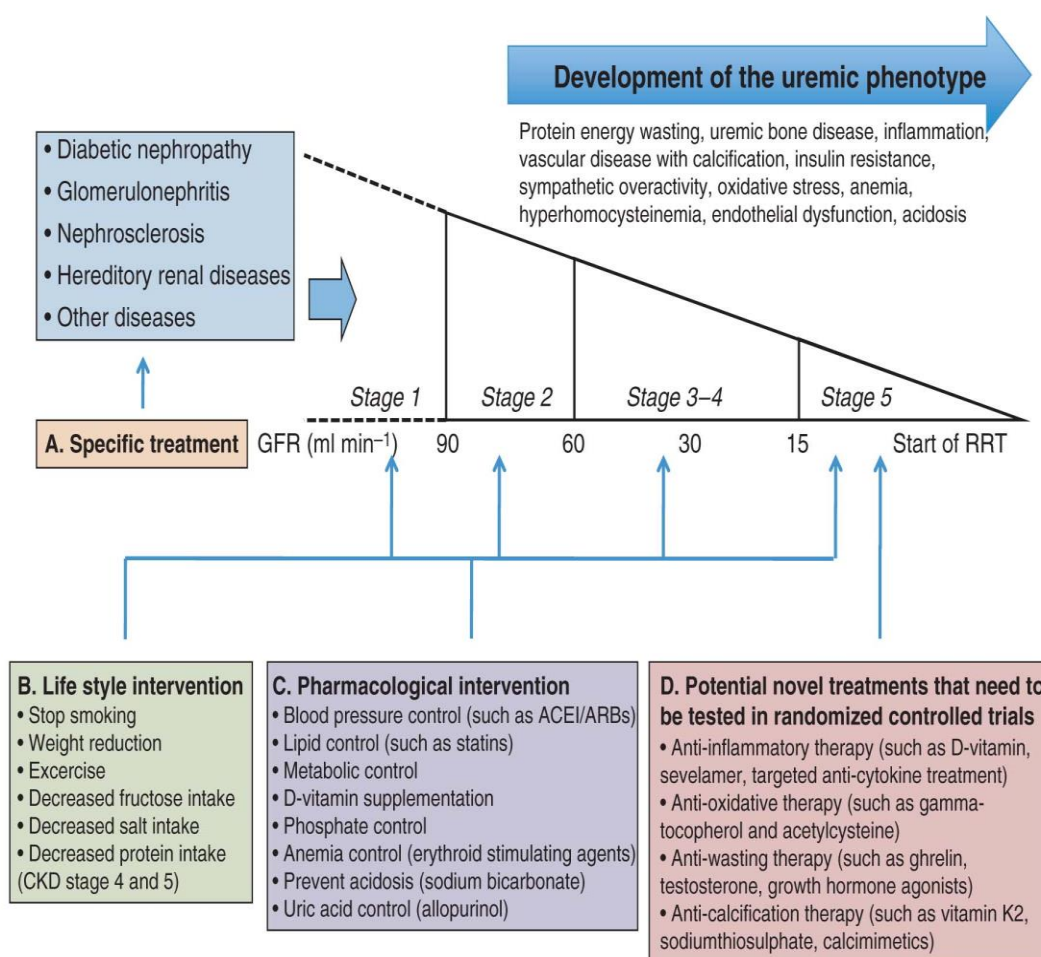


Figure 2.3 Diagrammatic representation of the causes of chronic kidney disease and the progression to end stage kidney disease and the need for renal replacement therapy (Stenvinkel, 2010).

Delay in detection and failure to institute timely preventative measures result in the faster deterioration of kidney function and the development of ESKD at a younger age. Late referral has further shown to affect the patient's choice of treatment and it increases the likelihood of switching treatments within the first three months. Such switching is either a result of a uniformed or urgent choice before the onset of RRT or an expression of inadequate preparation for the modality that was originally chosen. Switching treatments is associated with an overall increased cost (Wolfgang *et al.*, 2001).

Early referral enables an easier transition onto dialysis or a transplant programme when needed, with a reduction in complications, morbidity and mortality, and cost (White *et al.*, 2008; Mathew and Corso, 2009). An integrated intervention in India has shown success, achieving blood pressure and diabetes control and lowering prevalence of CKD at an annual cost of US\$ 0.43 per capita of population (White *et al.*, 2008).

Research has further shown a decline in mortality rate with more visits to a nephrologist. The KDOQI guidelines (2010) recommend initiating co-management with a nephrologist in patients with stage 3 CKD, and to refer patients to a nephrologist at the onset of stage 4 CKD (Meyer, 2008). Although, as reported by Meyer (2008), only 6.4% of patients visit a nephrologist.

Incidence rates of ESKD have declined in several parts of the world, through awareness programmes, particularly in the Netherlands, Scandinavia, and the USA, despite the overall growth in the dialysis population, which is inherent to a decreased mortality rate and an ageing population (Nissenson and Fine, 2008).

2.5 Chronic kidney disease

Chronic kidney disease is the progressive deterioration in kidney function with the permanent loss of functional nephrons. The Kidney Disease: Improving Global Outcomes (KDIGO, 2013) defines CKD as having a GFR of less than $60\text{ml}/\text{min}/1.73\text{m}^2$ or a urinary albumin to creatinine ration of greater than $30\text{mg}/\text{g}$ (Tomonaga *et al.*, 2013). The decline in kidney function could take several months to years to progress. Chronic kidney disease is characterised by having non-specific signs and symptoms, which include feeling tired, having less energy, and reduced appetite, dry and itching skin, and an overall lack of well-being (Crockell, 2012).

Globally the three leading causes of CKD are diabetes, hypertension and ageing (Crockell, 2012; Lowth, 2013). However, in developing countries approximately 75% of the dialysis population is between the ages of 20 and 50. The primary aetiology of CKD, particularly in Sub-Saharan Africa, is hypertension and glomerular disease; as many as one-third of the latter being related

to infection such as the Human Immunodeficiency Virus (HIV), which is very different to developed countries. In developed countries the CKD population is middle-aged and elderly, resultant from diabetes mellitus and hypertension (Naicker, 2010).

An additional threat to African populations is the major burden of infection, alongside non-communicable disease. This poses a “double burden” threat as reported by Naicker (2010). Infections and parasitic diseases are still the leading cause of death in Africa, with over 5.5 million deaths in 2005, with non-communicable disease moving up to 2.4 million deaths in 2005 (Naicker, 2010). Tuberculosis is endemic in several developing countries and the tuberculin skin positivity rates in the general population exceed 50%. Impaired cell-mediated immunity increases the susceptibility among the dialysis population (Jha and Chugh, 2003). Sub-Saharan Africa has the highest number of HIV-infected people, accounting for 23 million of the total 34 million of the global HIV burden (Figure 2.4) (WHO, 2012).

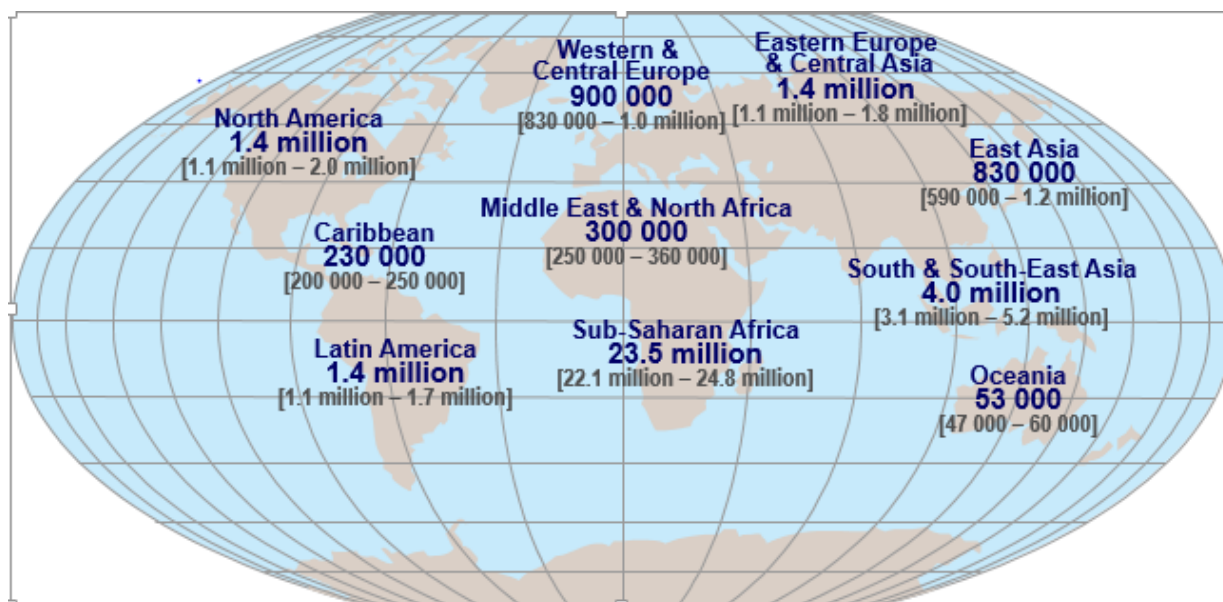


Figure 2.4 Estimated population to be living with Human Immunodeficiency Virus (WHO, 2012).

Minimal data is available on the magnitude of HIV in the dialysis population in developing countries. South Africa has a reported prevalence of 6-48.5% CKD in HIV-positive patients. The exponential growth of HIV-infected individuals globally is a cause of concern as it only a matter of time before such patients develop ESKD and require dialysis in developing countries where access to anti-retroviral medication is limited (Jha and Chugh, 2003; Naicker, 2010).

Worldwide hypertension is the leading non-communicable disease and is responsible for 13% of deaths. The prevalence of hypertension has been estimated at 16.2%, that is 75 million people in Sub-Saharan Africa (Poza *et al.*, 2012). Hypertension can be shown to be an important cause of CKD in Africa, with 25% in Senegal, 29.8% in Nigeria, 45.6% in South Africa, and 48.7% in Ghana. Hypertension is the cause of CKD in 21% of the patients on RRT and is predominantly found in black patients (Naicker, 2010; Taddei *et al.*, 2011).

Diabetes mellitus is a substantial contributor to the burden of disease in South Africa. It is estimated to affect 9.4 million people, along with the estimated 6 to 16% prevalence of diabetic nephropathy. Diabetes in Africa is expected to increase by 80% in the next 15 years (Naicker, 2010; Mash *et al.*, 2012).

Other risk factors for developing CKD include receiving nephrotoxic drugs, a family history, being overweight, and smoking. Conditions including polycystic kidney disease; reflux nephropathy, and lupus nephritis may lead to ESKD (Crockell, 2012).

The findings of a decade's worth of data from Cape Town showed that the cause of CKD for 31.2% of patients' was glomerulonephritis, followed by hypertension at 29.9%, and thirdly, HIV-associated nephropathy at 12.5%. Unidentified causes constituted a further 6.3% of the sample. Many times in Sub-Saharan Africa the aetiology of CKD is not identified, often a result of late referral or the lack of diagnostic tools such as ultrasound and biopsy (Okpechi *et al.*, 2012).

Left untreated, CKD can lead to morbidity and mortality from one of many complications, including cardiovascular disease, anaemia, electrolyte imbalances, mineral and bone disorder (MBD), malnutrition and kidney failure. In addition, co-morbid conditions such as diabetes mellitus, cardiovascular disease and infection rates have further been related to survival rates (Capelli and Kushner, 2008; Crockell, 2012).

Mortality is 10 to 20 times higher than in the general population (Crockell, 2012). The high mortality rates over the last few years have drawn tremendous attention and controversy. Some claim that as many as a quarter of patients in the USA die unnecessarily each year. Several clinical measures have been attributed to patient survival; they include albumin and haemoglobin levels, MBD and adequacy of dialysis, with particularly focus on time on dialysis (Capelli and Kushner, 2008; Crockell, 2012).

2.6 Clinical management of advanced chronic kidney disease

As kidney disease progresses to a more advanced stage ($GFR \leq 45 \text{ ml/min/1.73m}^2$), the kidneys begin to become unable to maintain normal fluid and electrolyte imbalances, resulting in the accumulation of water electrolytes and metabolic waste products. There is a further reduction in the production of renal hormones, particularly calcitriol and erythropoietin (Crockell, 2012).

Quality of life declines in advanced CKD as many factors that affect QOL, including anaemia, mineral and bone disorders, and malnutrition are present before patients commence RRT (Bakewell *et al.*, 2002).

2.6.1 Mineral and bone disorder

Mineral and bone disorders present early in CKD (stage 3 and stage 4); starting before the presence of symptoms. It is called the 'silentcrippler'. Chronic kidney disease-mineral bone disorder (CKD-MBD) is a generic terms used to describe the biochemical, skeletal and vascular changes that occur in CKD (Lewis, 2012).

The cause of MBD is a reduction in calcitriol production and hypocalcaemia, with an increase in phosphate and parathyroid hormone (PTH). The increased excretion of phosphate results in low active vitamin D₃; resulting in further hypocalcaemia. The elevated PTH stimulates the osteoclasts. The osteoclastic bone reabsorption causes an increase in calcium in the bloodstream, which was released from the bones. There is a resulting loss of bone mass, weakening of bones, and formation of cyst-like tumours around the bones (Crockell, 2012).

Reduced calcitriol levels have been reported in patients with GFR below 60ml/min, either as a direct result of phosphate retention or as a secondary effect via fibroblast growth factor 23 (FGF-23) stimulation. Parathyroid hormone levels increase when GFR declines to 50ml/min, and calcium and phosphate levels remain normal until the GFR reaches 20ml/min (Brancaccio and Cozzolino, 2011; Lewis, 2012).

Chronic kidney disease-mineral bone disorder is characterised by a broad clinical syndrome. It is implicated not only in bone fragility, but also in cardiovascular disorders (Table 2.4), including cardiovascular calcifications, hypertension and left ventricular hypertrophy, and has been associated with progression of kidney injury (Ogata *et al.*, 2007).

Table 2.4 Potential pathogenic factors of cardiovascular disease in CKD-MBD (Ogata *et al.*, 2007).

Factor	Putative effect
Decrease in calcium	<ul style="list-style-type: none"> • Increased vascular tone
Increase in phosphate	<ul style="list-style-type: none"> • Interstitial fibrosis in arteries and heart • Vascular smooth muscle cells proliferation, phenotypic transformation to osteoblastic cells • Increase in renin-angiotensin system
Decrease in vitamin D receptor	<ul style="list-style-type: none"> • Increase in cardiomyocyte hypertrophy • Increase in atrial natriuretic peptide • Increase in collagen synthesis • Increase in blood pressure
Increase in parathyroid hormone	<ul style="list-style-type: none"> • Interstitial fibrosis in arteries and heart

Mineral and bone disorders have been associated with a decline in QOL, particularly in the presence of fractures and cardiovascular hospitalisation. Treatment of MBD has shown an improvement in the physical composite score (PCS), pain and general health perception scales in a QOL survey (Cunningham *et al.*, 2005).

2.6.2 Anaemia management

The kidney is further responsible for the production of erythropoietin, a peptide hormone which stimulates the proliferation of red blood cells in the bone marrow. Anaemia becomes evident in kidney disease with a corresponding reduction in glomerular filtration rate (GFR). Haematocrit is inversely proportional to serum creatinine, as shown in the figure (Figure 2.5) below.

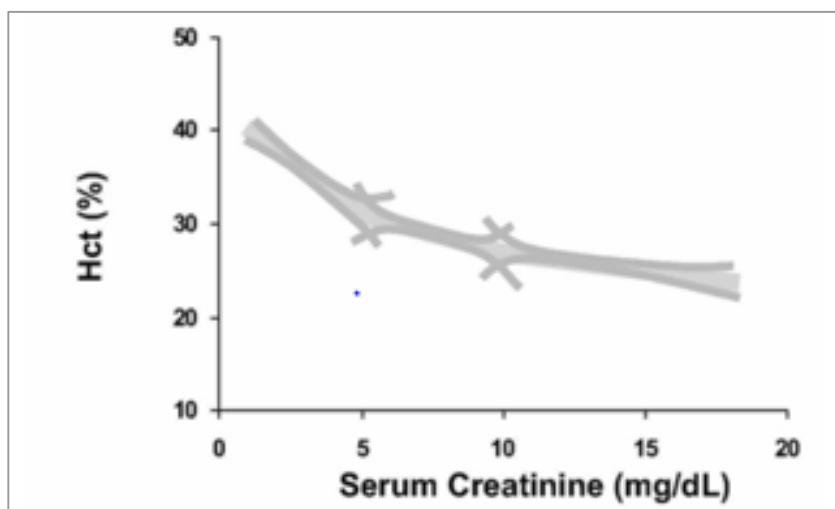


Figure 2.5 The association between haematocrit and serum creatinine (Dowling, 2007).

The greatest decline in haematocrit is seen in the early stages of kidney disease (Figure 2.5).

Although insufficient erythropoiesis production is the primary cause of anaemia, in CKD, various secondary causes may contribute to anaemia and include a deficiency in iron, folate or vitamin B₁₂, gastrointestinal bleeding, severe hyperparathyroidism and inflammatory conditions (Dowling, 2007).

Anaemia is associated with a rapid decline in kidney function, increased risk of hospitalisation, and increased mortality. Anaemia is furthermore directly related to the development of left ventricular hypertrophy, worsening heart failure, angina and other cardiovascular complications (Dowling, 2007; Crockell, 2012; Portolés *et al.*, 2013).

Treatment of anaemia has shown to increase energy levels and work capacity, improve cardiac indices and health-related quality of life (HRQOL), and decrease mortality (Dowling, 2007).

2.6.3 Nutrition in chronic kidney disease

The prevalence of malnutrition remains unchanged despite the progress in patient care and dialysis techniques (Fouque *et al.*, 2011). Protein energy malnutrition and wasting has been shown to be prevalent in approximately 18 to 75% of CKD patients, with an average of 40% undergoing maintenance dialysis (Fouque *et al.*, 2008).

The International Society of Renal Nutrition and Metabolism (ISRNM) defines “kidney disease wasting” as the occurrence of

protein-energy wasting (PEW) in CKD or acute kidney injury (AKI) regardless of the cause. PEW is the state of decreased body stores of protein and energy fuels (body protein and fat masses). Protein or energy depletion in CKD can be a result of an inadequate diet and loss of lean body mass not related to the reduced nutrient intake. These include non-specific inflammatory processes; transient, inter-current catabolic illnesses; nutrient losses into dialysate; acidemia; endocrine disorders such as resistance to insulin, growth hormone, and insulin-like growth factor; hyperglucagonemia; hyperparathyroidism; and loss of blood into the haemodialyser, or by blood drawing. Inflammation in CKD contributes to mortality because of the resultant vascular calcification development and endothelial dysfunction (Figure 2.6) (Kalantar-Zadeh, 2005; Fouque *et al.*, 2008; Silverstein, 2009).

Dialysis treatments, as described by Fouque *et al.* (2008), induce a loss of nutrients (glucose, amino acids, vitamins and trace elements) through the dialysis filter. This is even more prevalent today with the greater use of more porous membranes and/or more efficient techniques. In addition, the dialysis procedure itself is a catabolic event responsible for protein catabolism (fragmentation of albumin, release of pro-inflammatory cytokines and the use of heparin) (Figure 2.6).

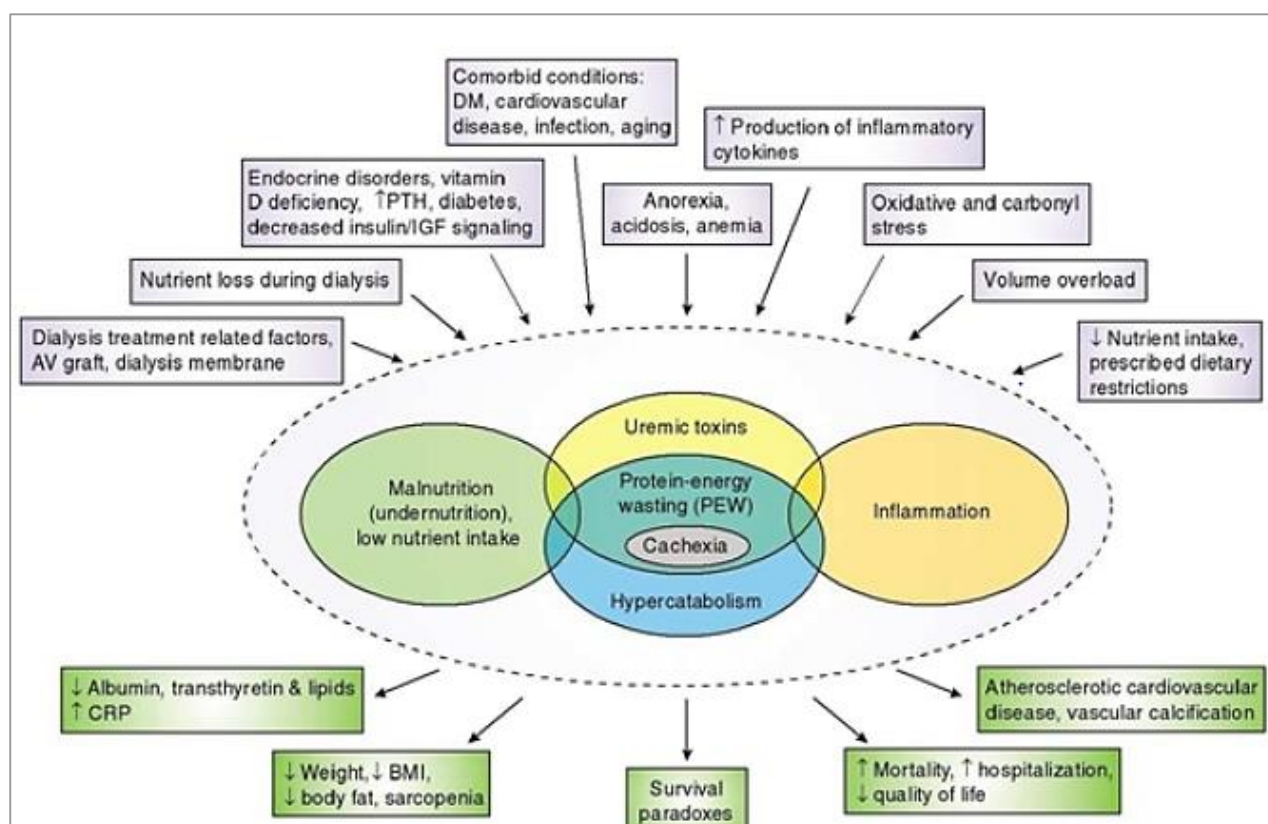


Figure 2.6 The cause and symptoms of protein-energy wasting syndrome in kidney disease (Fouque *et al.*, 2008).

Nutritional status has a significant impact on QOL. Malnutrition in ESKD is associated with an overall decline in QOL. Overweight and obese patients have reported a greater number of symptoms when on dialysis (Moreira *et al.*, 2013).

2.6.4 Blood pressure management in chronic kidney disease

Blood pressure (BP) management in CKD patients poses a unique challenge. Hypertension has shown to be prevalent in 86% of patients with CKD. The ability to maintain a blood pressure within the targeted range of <130/80mmHg remains dismal at 13.2% (Shafi *et al.*, 2012).

Blood pressure is dependent on the complex interplay of fluid volume and prescription of post-dialysis target weight, sodium load, the renin-angiotensin and sympathetic nervous system, and the diverse exogenous factors, which include the administration of erythropoiesis stimulation agents (ESA), prescribed antihypertensive medication and dialysate concentration (Levin *et al.*, 2010). A study by Okpechi *et al.* (2013) indicated the association of blood pressure to cognitive function domain in QOL.

With the progression of CKD it is critical to assess patients for complications, including anaemia, MBD and malnutrition. Management of these complications can alter the course of the disease and improve long-term care and patient outcome (Crockell, 2012).

The correction of achievement of a target of care of each complication outlined above (anaemia, nutrition, MBD and blood pressure management) has been shown to be associated with improved outcomes overall, but in particular as relevant for this study, they are all associated with improved QOL. This makes it important as part of the assessment and management of patients with ESKD who are on dialysis.

2.6.5 Psychosocial factors associated with chronic kidney disease

Chronic kidney disease is an existential struggle - the patient's illness ultimately threatens their existence (Hagren *et al.*, 2005). Despite treatment, including dialysis prolonging the lives of patients with ESKD, patients often must cope with deleterious changes in their health and life situation and shortened survival (Hutchinson, 2005). Kidney disease is a complex disease and is difficult to treat. It is a disease with profound effects on a patient's life, with serious physiological and socioeconomic implications for the individual, family and community (Morsch *et al.*, 2006).

Dialysis serves as a constant reminder to the person suffering from CKD that they are living on 'borrowed' time (Hagren *et al.*, 2005). Dialysis patients are faced with serious stressors related to the illness and its treatment, arising from the chronic nature of the disease and the intrusiveness of the medical treatment. Patients are often confronted with limitations in food and fluid intake; with physical symptoms such as itching and lack of energy; with psychological stressors such as loss of self-concept and self-esteem, feelings about uncertainty about the future, loss of freedom, dependence on dialysis and feelings of guilt towards family members, and with problems in the social domain (Hagren *et al.*, 2005; Timmers *et al.*, 2008).

Although dialysis prolongs survival, it does not return the lives of patients to their state of health prior to the illness (Hutchinson, 2005). The time spent traveling to and from dialysis, along with the actual treatment time, gives patients very little actual time for living (Hagren *et al.*, 2005). Patients are often further confronted with additional challenges, including residual uraemic symptoms, complications of underlying diseases, vascular access problems, and overall shortened life expectancy. Table 2.5 shows the major transition in the lives of patients with kidney disease. Each transition poses a threat to the patient's perspective and requires a multifaceted adjustment and reorientation to cope with it effectively, according to Hutchinson (2005).

Table 2.5 The major transition in the lives of end stage kidney disease patients(Hutchinson, 2005).

Major transitions in the lives of end stage kidney disease (ESKD) patients

- Diagnosis of kidney disease
- Diagnosis of progression; ESKD inevitable
- Obtaining vascular or peritoneal access
- Starting dialysis treatment
- Change to a different dialysis modality
- Receiving a kidney transplant
- Failure of vascular or peritoneal access
- Failure of kidney transplant and return to dialysis
- Major medical complication
- Loss of function (e.g. loss of a limb, loss of vision, decreased function to cardiac dysfunction)
- Loss of employment
- Change in living arrangements (e.g. transfer to a nursing home or long-term care facility)
- Death of another patients with who a relationship has developed
- Decision to stop dialysis
- Impending death

Despite dialysis and transplantation being highly effective, it does not return the patient's life expectancy back to that of the general population, as shown in Figure 2.7. End stage kidney disease patients on treatment have similar mortality rates as patients with prostate and colon cancer (Hutchinson, 2005).

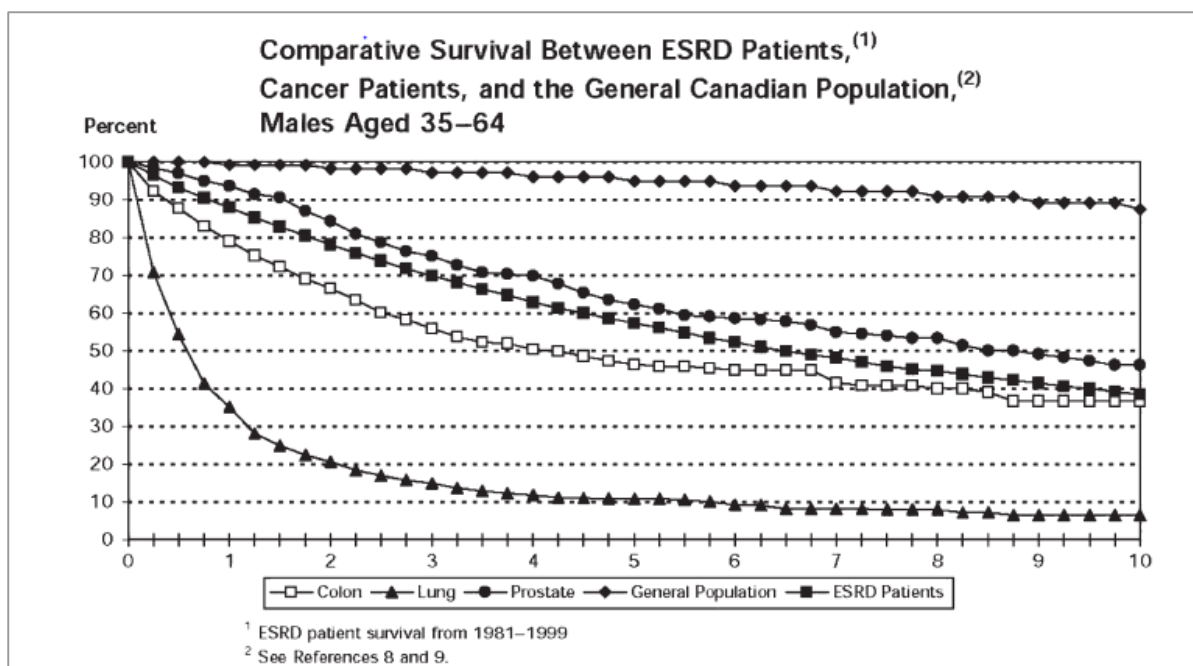


Figure 2.7 Survival of end stage kidney disease patients in comparison to the survival of patients with cancer to that of the general population.

Although the nephrology team is equipped to deal with the medical and technical aspects of care, they are often less equipped to deal with psychosocial issues surrounding CKD. Several studies have shown that ESKD patients suffer from depression. Depression has been reported to be the most frequent psychological problem and is prevalent in 20 to 30% of ESKD patients. Depression is related to higher morbidity and mortality rates, poorer compliance to treatment, malnutrition, and inflammation (Park *et al.*, 2010; Tentori and Mapes, 2010).

However, helping patients cope with these challenges is an essential part of care, particularly if achieving QOL is a treatment goal (Hutchinson, 2005).

2.7 Renal replacement therapy

Recent advances in dialysis technology, solutes and membranes have resulted in effective treatment for individuals who previously faced certain death. The development of RRT, including dialysis and transplantation, has made it possible to prolong the lives of patients with CKD after they progress to ESKD.

For the vast majority of individuals this will be dialysis, either in-centre haemodialysis or at home peritoneal dialysis, despite kidney transplantation being the therapy of choice (Korevaar *et al.*, 2003; Stanley, 2010). Because the resultant increase in the incidence and

prevalence of kidney disease and a shortage of donors, more patients are remaining on dialysis for longer periods of time (Stanley, 2010).

Although medical, social or logistic considerations may preclude one of the dialysis forms, for most patients a well-considered deliberation has to be made between starting with haemodialysis or peritoneal dialysis (Korevaar *et al.*, 2003).

Haemodialysis is typically performed three times a week in-centre on a haemodialysis machine for three to five hours, nocturnal haemodialysis over six to eight hours, and short daily dialysis of three hours every day (Berger *et al.*, 2009). In contrast, PD uses the lining of the abdomen, the peritoneal membrane, instead of a dialyser to filter the blood. The infused dialysis fluid acts as an osmotic agent removing waste products, over the process known as an exchange, which for continuous ambulatory peritoneal dialysis (CAPD) is performed four times a day. Alternative peritoneal dialysis modalities include automated peritoneal dialysis, with an automated cycler performing the exchanges overnight (Berger *et al.*, 2009).

The Centre for Medicare and Medicaid Services (CMS) calls for an unbiased presentation of all modalities to patients with ESKD before initiating RRT (Key, 2008). Giving a patient choice of treatment has shown to improve QOL (Avramovic and Stefanovic, 2012). However, the United States Renal Data System (USRDS) Wave study found that only 25% of patients on haemodialysis (HD) remembered receiving information about peritoneal dialysis (PD) (Kellum and Hoste, 2008). In most situations a particular type of dialysis is excluded as a result of a person's medical or social circumstance. Difficulty in coordinating a particular type of dialysis may become an exclusion factor. In the majority of cases a patient will make a thoughtful decision when selecting between HD or PD or choosing a palliative end of life care option (Korevaar *et al.*, 2003).

In a developing country choice of modality is not always available (Trevino-Becerra and Maimone, 2001; Jha and Chugh, 2003). Peritoneal dialysis has become the preferred dialysis option for ESKD in countries with fixed annual healthcare allocations because of its cost-effectiveness due to elimination of capital costs in setting up a unit and considering that HD units are not available to a large number of patients living in rural or remote areas (Jha and Chugh, 2003). In the Mexico Model, all patients initially received PD as a first-line therapy. Peritoneal dialysis was a more cost-effective therapy. However, it resulted in raised medical costs which were due to long hospitalisations and re-operations. The model failed to take into account the absolute and relative contra-indications to PD, which caused the model to fail over and over

again. The few hospitals that practised HD were over their capacity due to failed PD patients, patients on HD and those awaiting transplantation (Trevino-Becerra and Maimone, 2001).

The USRDS (2007) reported the highest PD rates in Hong Kong (83%) and Jalisco, Mexico (72%). Other countries with prominent PD rates included Iceland (35%), Australia (21%), and the UK (20%). In 2005, only 7.6% of Americans on dialysis used PD, while 90% were on HD (Kellum and Hoste, 2008). Berger *et al.* (2009) reported findings indicating that 25% to 33% of PD patients switch to HD compared, with only 3% to 5% of HD patients who switch to PD.

Benefits have been hypothesized for PD versus HD, including flexible scheduling; fewer needle sticks (preservation of arteriovenous access sites for future HD and minimizing the risk of blood-borne infections); and better preservation of residual renal function (Berger *et al.*, 2009). In addition, PD has been associated with greater patient satisfaction with dialysis care and with a reduced burden of kidney disease (Berger *et al.*, 2009; Maier *et al.*, 2009).

A randomised control trial was performed by multiple centres in the Netherlands with only 38 patients recruited. The results after adjusted for age, co-morbidity score and primary kidney disease showed a small difference in the quality-adjusted life-year score (QALY) between patients starting on HD and PD. Peritoneal dialysis showed a more favourable survival in the first four years, when compared to commencing with HD. However, the study was limited by the sample size and was prematurely discontinued as a result (Stanley, 2010).

The 'Comparing the risk for death with at home PD and in-centre HD in a national cohort of patients with CKD (CHOICE) study' had a sample size of 1041 patients on HD and PD from 81 centres in the USA. After adjusting scores, the risk of death was similar between HD and PD patients undergoing treatment in the first year. However, in the second year the mortality risk was significantly higher in the PD group. Inadequate dialysis adequacy measures and failure to record change in treatment were major limitations in the study (Stanley, 2010).

The USRDS registry data was extracted for 204 000 patients over a seven year period and showed a significant difference in the mortality rates, according to specific cohorts studied such as age, diabetes and gender. There was no significant difference in the adjusted death rate for diabetics; the risk was more pronounced in females. A lower mortality rate for patients under 50 years of age was found when treated with PD. However, failure to adjust for

comorbidity, disease severity and nutritional status were major limitations in the study (Stanley, 2010).

2.8 Transplantation

After kidney transplantation, patients face many new challenges including rigorous medication regimens, along with the uncertainty and fear of organ rejection. Patients continue to deal with a life of chronic illness (Suet-Ching Luk, 2003). Despite these factors, kidney transplantation has shown to provide the highest QOL score. Transplant patients have reported to have improved physical health, increased level of activity, and improved social interaction (Shu-Fen and I-Chuan, 2005). A study by Suet-Ching Luk (2003) has shown significant improvement in physical functioning, ranging from 70 percent to full recovery post-transplant. Research has shown transplantation to be better than dialysis, both in terms of economics and QOL (Suet-Ching Luk, 2003; Fiebiger *et al.*, 2004). This has become increasingly evident with the advances in immunosuppressive therapy and improved graft and patient survival (Fiebiger *et al.*, 2004).

Transplantation is not available to many patients undergoing dialysis. Worldwide demand for transplants is not satisfied. In South Africa the shortage of available organs has resulted in an increase in the length of time a patient will be on dialysis waiting for a suitable donor (Figure 2.8.), with a corresponding decline in QOL (Santos *et al.*, 2009; Persy *et al.*, 2010).

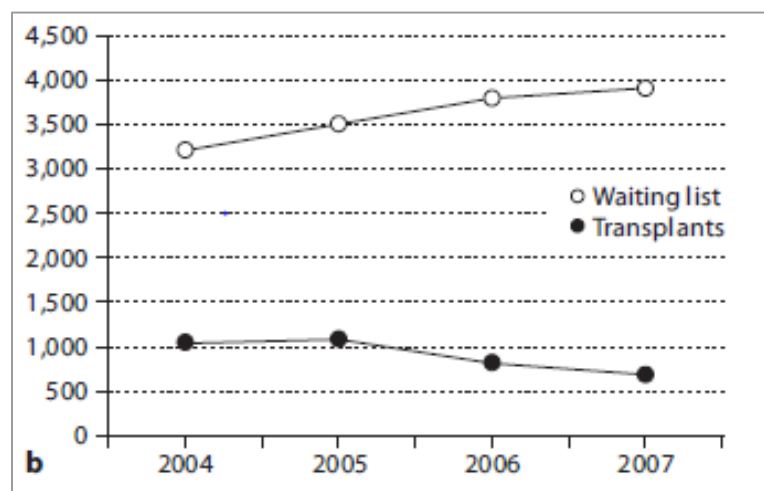


Figure 2.8 Transplantation and related waiting lists in South Africa (Persy *et al.*, 2010).

The decline in transplantation is not only a result of insufficient availability of organs, but is further aggravated by limited resources. The funding for public hospitals in South Africa has been

curtailed, and permanent staff shortages and lack of infrastructural support have compounded the issue (Pitcher *et al.*, 2006).

2.9 Non-dialysis pathway

For some patients dialysis is 'torture' and the first 90 day mortality amongst CKD patients is shocking, particularly amongst the elderly, those with a number of co-morbid conditions and increased level of dependency from the start of dialysis. Some patients may choose not to start dialysis. While patients discontinuing dialysis may survive a week or two, this may not necessarily be true for patients electing not to start dialysis, leaving patients with many anxieties. Patients may choose a palliative, end of life care or alternatively known as the maximum conservative management pathway. This pathway focuses on a person's QOL and concentrates on minimizing the symptoms of kidney failure, freedom from pain, preparation for death, and the opportunity to achieve a sense of completion (Price, 2003; Burns and Carson, 2007). Palliative care is defined as comprehensive management of the physical, psychological, social, spiritual and existential needs of patients. It is especially suited to the care of people with incurable, progressive illnesses (Price, 2003).

Palliative care should be offered to patients considering ESKD, and especially those patients who are known to have poorer outcomes, for example elderly patients over 80 years. It may even be appropriate in environments where dialysis is not affordable or associated co-morbid conditions are untreatable. It is for all these situations that those people with advanced kidney failure are offered management alternatives which may offer them a better QOL. This pathway may include a conservative treatment pathway or withdrawal from dialysis. While dialysis may offer a better quality and quantity of life compared to conservative management, this may not always be the situation; hence, the patient is entitled to be well informed of all options and the potential outcome before embarking on such therapy. Quality and quantity of life are critical areas around the selection of treatment pathways, however, no randomised control trials have been conducted in this area and only a small number of observational studies provide guidance, thus predicating which patients will have poor outcomes is problematic (Fassett *et al.*, 2011).

2.10 Financial burden of chronic kidney disease management

Economic and manpower factors often determine the availability of in-centre HD; in low-income societies ESKD patients often die without the benefit of RRT due to a lack of funds (Bamgboye, 2003). In India and Pakistan, treatment for ESKD is a low priority for public hospitals with minimal resources. Less than 10% of all patients in Pakistan and India receive RRT whereas 50% of patients in South

Africa receive RRT (Schieppati and Remuzzi, 2005; Pozo *et al.*, 2012).

Fifteen percent of the world's population is receiving haemodialysis - 80% of the patients are in Europe, North America and Japan. The remaining 20% is treated in 100 developing countries that constitute 50% of the world's population. Fewer than 5% of patients globally are from Sub-Saharan Africa. A large percentage of people living in the poorest countries die of uraemia, a treatable condition (Schieppati and Remuzzi, 2005; Pozo *et al.*, 2012).

In the majority of countries in Sub-Saharan Africa, dialysis is funded by the patient. As shown below (Figure 2.9), 75% of patients can afford to pay for dialysis for less than a week, 14% for up to four weeks, 7% for up to 12 weeks and only 4% of patients can afford dialysis for more than 12 weeks (Persy *et al.*, 2010).

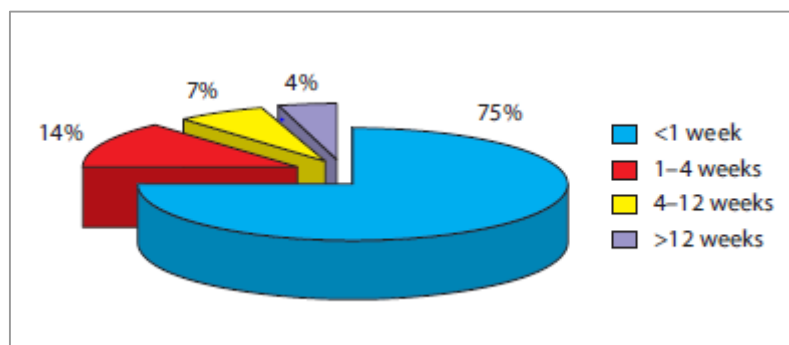


Figure 2.9 Affordability of dialysis in Sub-Saharan Africa (Persy *et al.*, 2010).

The benefits of stretching healthcare resources during a time of dwindling resources cannot be overlooked. Transplantation offers a reduction in the cost from the second year; however, it is limited by organ availability. Transplantation as a modality of RRT is not widely available in low-income countries. While the USA, Europe and the Middle East have 30% of ESKD patients transplanted, Sub-Saharan Africa with the exclusion of South Africa has less than 1% transplanted. In Bangladesh, the prevalence rate of a functioning graft is only 2.6 PMP. In India and Pakistan, only 5% of ESKD patients will receive a kidney (Schieppati and Remuzzi, 2005; Persy *et al.*, 2010).

The costs of home PD can be substantially less than in-centre HD. Self-care dialysis not only preserves nursing resources, but costs approximately \$20 000 less per year than in-centre HD (Kellum and Hoste, 2008).

Despite the overall costs of PD compared to in-centre HD, Medicare's system pays similarly for either modality. This may seem to make either modality equally attractive and even make PD more attractive; however the cost of maintaining an HD facility may encourage clinicians to direct patients to in-centre HD to fill all available slots. The slot will exist whether filled or not, thus it becomes more profitable for already under-reimbursed providers to make use of the HD slot. Setting up a patient at home for PD incurs new costs and leaves the HD centre with an empty, profit draining chair (Kellum and Hoste, 2008).

A study performed by Berger *et al.* (2009) showed 12% of their sample commenced PD; a total of 56 versus the 407 HD patients, with it being estimated 76 to 79% of patients had no contraindications and could receive either modality. Their study results suggest that an expanded use of PD, in lieu of HD, may yield substantial economic benefits to private payers (Berger *et al.*, 2009).

Berger *et al.* (2009) further found that patients beginning PD were significantly less likely than those initiating treatment with HD to be hospitalised over 12 months and had significantly lower total healthcare costs over this period.

Healthcare shortages coincides with the burgeoning ESKD population, providing self-care dialysis options reserves labour intensive resources for those unable to participate in self-care (Kellum and Hoste, 2008).

2.11 Health-related quality of life

Health-related quality of life (HRQOL) has become an increasingly important marker of treatment quality in many chronic diseases (Rodrigues Fructuoso *et al.*, 2011).

Quality of life is defined as the subjective assessment of the impact of disease and its treatment across the physical, psychological and social domains of functioning and welfare (Figure 2.10) (Finkelstein *et al.*, 2009; Pagels *et al.*, 2012).

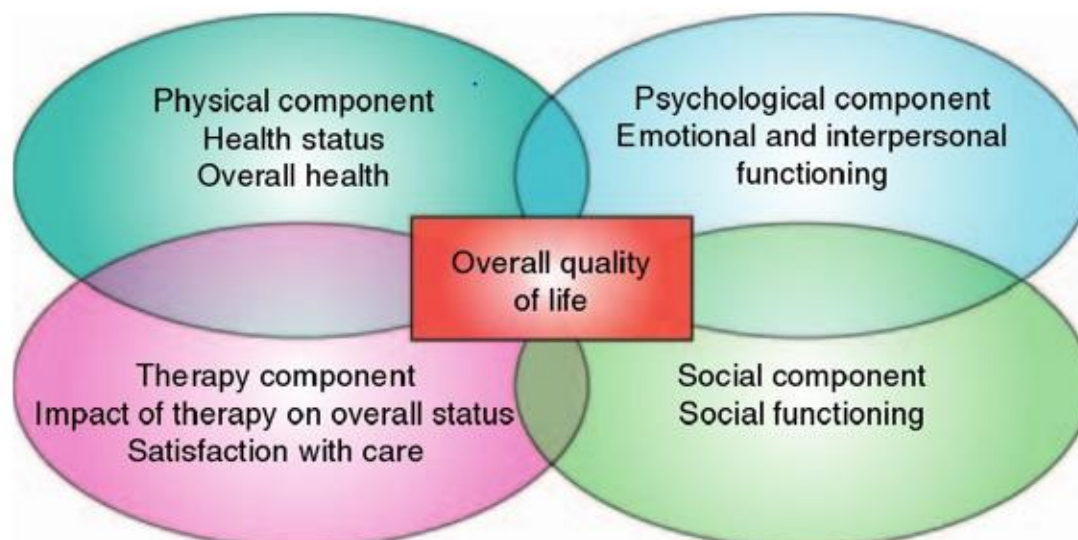


Figure 2.10 Health-related quality of life (Finkelstein *et al.*, 2009).

Quality of life has additionally been defined as “a systemic framework through which to view work aimed towards improving the lives of individuals” (Galloway, 2005).

The HRQOL areas of difficulty most often cited for CKD is cognitive dysfunction, depression, anxiety, pain, sleep disturbance, reduced physical functioning, sexual dysfunction, reduced social interaction, and reduced global perception of general health or QOL. Symptoms commonly reported are muscle weakness, restless legs and post-dialysis fatigue (Finkelstein *et al.*, 2009).

2.11.1 Measuring quality of life

Quality of life in CKD is important to measure as ESKD is a fatal disease without therapeutic intervention. The therapeutic intervention in the form of RRT is further associated with significant side effects and functional impairment (Fayers and Machin, 2007).

Traditionally medicine has focused on symptom relief as an outcome measure; however, as with many chronic diseases, including CKD, QOL has proven to be equally or more beneficial to patients as an outcome measure (Fayers and Machin, 2007).

The collection of QOL data and communication to patients, according to Fayers and Machin (2007), has shown to be beneficial to patients; it has enabled patients to better understand their disease, the consequences of their illness and its associated treatment.

The United States Centre for Medicare Services has mandated the measurement of HRQOL routinely, within four months of initiation

of treatment and yearly thereafter, unless a life-changing event occurs, in which case more frequent measurements are to be taken (Finkelstein *et al.*, 2009).

2.11.1.1 Approaches to measuring quality of life

Observers have shown to be poor judges of patients' opinions. Independent assessments by both healthcare providers and patients' relatives have shown major differences to reported outcomes from patients. Observers have a tendency to underestimate the psychological impact and overestimate the more obvious symptoms such as pain, nausea and vomiting (Fayers and Machin, 2007).

Often patients are willing to accept unpleasant therapy in exchange for a modest benefit in terms of cure; whereas healthcare professionals are more likely to say they would refuse care for little benefit (Fayers and Machin, 2007).

Healthcare professionals base overall QOL on physical signs and symptoms and toxicity. However, in many diseases including CKD conventional clinical outcomes have proven to be poorly correlated with patients' assessment of QOL (Fayers and Machin, 2007).

Patients' perceptions of QOL and general well-being are influenced by both the clinical manifestation of their disease as described above (2.6) and the beneficial or adverse effect of their treatment, as well as other non-biological factors, including patients' cultural beliefs and their individual value (Oliveira *et al.*, 2012).

2.11.2 Instruments measuring quality of life

A variety of tools evaluating HRQOL are available. Quality of life assessments can be classified as either generic or disease specific (Nissenon and Fine, 2008; Danquah *et al.*, 2010). Generic instruments include single indicators, health profiles and utility measures, whereas disease specific instruments focus on a particular disease or population (Danquah *et al.*, 2010).

2.11.2.1 Generic instruments

Generic instruments evaluating QOL in adult patients on dialysis include the World Health Organization Quality of Life-Bref (WHOQOL-BREF), which is a 26-item questionnaire with four domains plus an overall QOL and general health score. The use of the six domains in the score has been criticised, as the domains were selected with no rationale for use. Furthermore, the questionnaire excluded common domains of QOL, such as well-being and productivity. However, the WHOQOL-BREF has reported

a Cronbach's alpha score of greater than 0.69 for all scales and a 0.93 for the total scale (Galloway, 2005).

The Beck Depression Inventory (BDI) is a 21-item questionnaire used to measure depression and has a reported Cronbach's alpha of 0.89 in a study on the effect of an adaptation training programme on ESKD. Research papers presented on this instrument have not shown evidence of reliability or validity. The Cognitive Depression Index (CDI) is a 15-item subset of the BDI and assesses depressive symptoms. Research has not reported reliability but has shown the correlation between CDI and BDI and is associated with mortality in patients with kidney disease (Danquah *et al.*, 2010). A cross-sectional analysis of 628 subjects has shown unemployment, low income and lower QOL scale scores are independently and significantly associated with a higher Beck Depression score (Fischer *et al.*, 2010).

The Illness Effects Questionnaire (IEQ) subjectively assesses a person's perception of how an illness interferes with their personal, physical and social behaviour. The Illness Effects Questionnaire has a high internal and test-retest reliability and strongly correlates with depression in patients with kidney disease and other diseases (Danquah *et al.*, 2010). The Sickness Impact Profile (SIP) is a widely used instrument, containing 136 items that collectively describe the effect illness has on a patient's behaviour (Nissenson and Fine, 2008).

Another tool widely used is the Nottingham Health Profile (NHP) which measures the effect of physical, social and emotional health problems on functioning (Nissenson and Fine, 2008; Danquah *et al.*, 2010). A study done on the impact of sleep-related disorders on QOL of patients on HD using the NHP did not report any evidence on reliability or validity. However, in a study of patients with lower limb atherosclerotic disease, it was reported that the NHP showed evidence of content, convergent and discriminate validity (Danquah *et al.*, 2010).

The Karnofsky Scale consists of 11 categories used to measure the physical dimension of QOL. It ranks the performance status from a score of 0 for death to 100 for normal functioning (Nissenson and Fine, 2008; Danquah *et al.*, 2010).

The Quality of American Life (QALI) was initially developed to measure a patient's perceived QOL by measuring a patient's perception of their socio-psychological condition, needs, and expectations of life, as well as the degree to which those needs were satisfied. The scale has since been adapted into seven variables and two scales from the QALI to assess QOL after medical intervention (Danquah *et al.*, 2010).

The EuroQOL-5 Dimensions (EQ-5D) is the most widely used generic population based measure which measures QOL in any setting. It is made up of five domains defining health (Danquah *et al.*, 2010; Tajima *et al.*, 2010). A study using the EQ-5D questionnaire on 569 CKD out-patients in Japan showed the decline in HRQOL with the progression of CKD. It further showed anaemia, malnutrition, hypertension and diabetes to be related to a decrease in QOL (Tajima *et al.*, 2010).

The life satisfaction score (FLZ) consists of 16 dimensions, divided into eight domains, and results in two overall composite scores, a life satisfaction score and a general score. The internal consistency score for the two scores were reported to be 0.82 and 0.89 respectively (Goldbeck and Schmitz, 2001).

The QOL profile for chronic diseases (PLC) is a German questionnaire focusing on the psychological issues of living with a chronic disease. It contains 40 items, which are grouped into six functional or symptom scores. Each question has a five point rating system. A high internal consistency (Cronbach alpha score of >0.75) and a medium retest reliability (0.5 to 0.8) were demonstrated for the scales in different populations. It is, however, limited by the lack of disease specific symptoms scales (Goldbeck and Schmitz, 2001).

2.11.2.2 Disease specific instruments

As opposed to generic instruments, disease specific instruments are more sensitive in determining the range of impairment, more responsive to change, more flexible and have greater relevance to clinical dealing with a particular disease (Danquah *et al.*, 2010). Chronic kidney disease patients, in particular, present with a unique set of physical, psychological, social and occupational challenges; therefore they should be assessed with a disease specific tool (Nissenon and Fine, 2008).

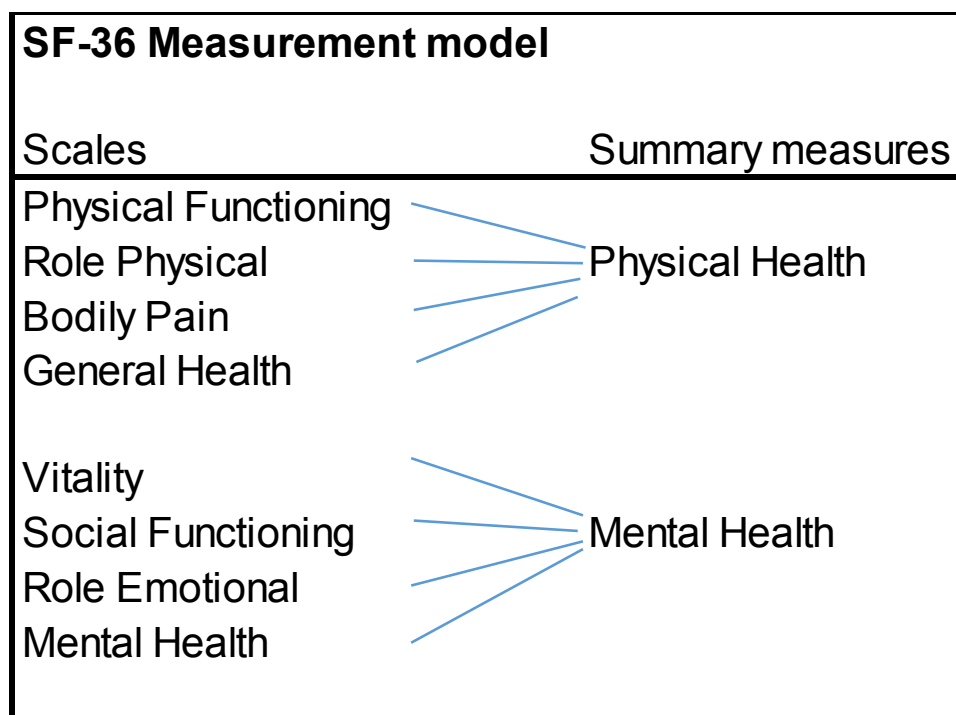
The Chinese Dialysis Quality of Life Scale (CDQOLS) is a disease specific instrument used for assessing QOL in Chinese dialysis patients. The CDQOLS is a 29-item, 5 point scale. The Ferrans and Powers Quality of Life Index of dialysis (QLI) is a two part 64-item, 6-point measure with 32 items in each part. The QLI measures satisfaction with various aspects of life and the importance of each aspect of life to the person. Evidence of reliability (test-retest: 0.81) has been reported, along with validity (content, construct and criterion validity) on 88 graduates and 37 dialysis patients (Danquah *et al.*, 2010). However, in the 2002 self-care, self-efficiency study on patients on HD no evidence of validity or reliability was reported (Danquah *et al.*, 2010).

One of most widely used disease-specific HRQOL instruments is the Medical Outcomes Study (MOS) 36-Item Short-Form Health Survey, SF-36. The US Medicare system has endorsed the preferential use of the SF-36 questionnaire (Finkelstein *et al.*, 2009).

The SF-36 is a validated 36-item questionnaire covering issues related to physical, psychological and social functioning that generates score from 0 (worst) to 100 (best) for eight sub-scales of QOL. The physical functioning (PF) scores a patient's performance related to daily activities; role-physical (RP) regards the impact of physical health; bodily pain (BP) evaluates the pain level and its impact on normal dialysis activities; general health (GH) evaluates subjective perception about present and future health status and resistance to illness; vitality (VT) scores a patient's feelings about his/her energy levels, vitality and moments of fatigue; social functioning (SF) scores the impact of health on routine social activities; role-emotional (RE) measures the influences of emotional status on daily activities; and mental health (MH) scores humour and well-being, including depression and anxiety (Figure 2.11) (Lopes *et al.*, 2007; Nissenon and Fine, 2008; Santos *et al.*, 2009).

The two summary scores of the SF-36, the physical component summary (PCS) and the mental component summary (MCS), are derived from the eight scales (Figure 2.11.). The PCS is defined as the extent to which health limits physical activities such as self-care, walking, climbing hills and stairs, and moderate and vigorous activities. The mental component score includes depression, behavioural/emotional control, anxiety, feeling of belonging and the positive affect. The two summary score enable a fast evaluation of the HRQOL, with minimal loss of information when the eight scales are resumed in the two main components, physical and mental (Hays *et al.*, 1995; Lopes *et al.*, 2007; Nissenon and Fine, 2008; Rodrigues Fructuoso *et al.*, 2011).

Figure 2.11 Diagrammatic representation of SF-36 model (Lopes *et al.*, 2007).



The total scores in the SF-36 are further compounded to yield three cumulative scores, the symptom/problem list, the effect of kidney disease on daily life, and the burden of kidney disease, which is defined in Table 2.6 (Mazairac *et al.*, 2012).

Table 2.6 The kidney disease quality of life short form: kidney disease specific scales (Mazairac *et al.*, 2012).

Domains	Meaning	
	Low	High
Symptom/problem list	Extremely bothered by dialysis-related symptoms such as muscle cramps, pruritus, anorexia, and/or access problems	Not at all bothered
Effect of kidney disease on daily life	Extremely bothered by fluid and dietary restriction, by an inability to travel and dependency on doctors	Not at all bothered
Burden of kidney disease	Extremely bothered by the time consumed by dialysis, its intrusiveness and degree burden on family	Not at all bothered

The kidney disease quality of life short form (KDQOL-SF™) was developed to take into account particular concerns of patients with kidney diseases and ESKD. The SF-36 questionnaire is a

multidimensional, reliable and validated questionnaire specifically designed for dialysis patients. Reliability of the SF-36 has been estimated previously over a wide range of health problems using both internal consistency measures (Cronbach's alpha and inter-item correlations) and test-retest methods (Cleary, 2005). Danquah *et al.* (2010) reported a Cronbach's alpha of 0.91 for the PCS and 0.88 for the MCS.

The HRQOL scales of the SF-36 are scored in five steps: 1) data cleaning, the changing of out of range scores to missing values; 2) item recalibration and skip pattern recoding; 3) reverse scoring of items; 4) transforming item score within a range of 0-100, with the higher score indicating the absence of complications; 5) averaging items across the scores (Hays *et al.*, 1995; Mazairac *et al.*, 2012).

Studies using the SF-36 have indicated that reduced scores in HD patients are associated with significantly higher hospitalisation rates and mortality. For example, reduced PCS (<25) on the SF-36 Health Survey have been associated with nearly a twofold greater chance of death and a 60% greater chance of hospitalisation than patients (after corrections for a variety of standard variables) in studies involving several thousand HD patients in the Dialysis Outcomes and Practice Pattern Study (DOPPS) (Finkelstein *et al.*, 2009).

Although there are multiple HRQOL tools that have been well documented in terms of validity and reliability, each take a different approach to measuring the highly complex construct of HRQOL (Saban *et al.*, 2008).

Instruments used to assess HRQOL should involve both subjective and objective measures. Subjective assessments involve patient-reported outcomes, which can be defined as measurements of any aspect of a patient's health status that comes directly from the patient, without the interpretation of the response by a healthcare provider. The importance of patients' perceptions of their own physical and mental functioning has been emphasized. The patient is the expert when it comes to assessing his/her own QOL. This is particularly important, as it permits the formulation of effective treatment strategies for the individual patient (Finkelstein *et al.*, 2009).

On the other hand, the medical team may need to include objective assessments of the patient's status to evaluate the impact of health on QOL and formulate clinical intervention strategies. For example, physical functioning can be assessed by patient reporting or documented by a variety of objective measures, such as six minute walking test or treadmill exercise testing (Finkelstein *et al.*, 2009).

Together with objective health measures, subjective rated HRQOL is important in the treatment evaluation of patients with chronic disease (Boini *et al.*, 2011).

Quality of life must evolve from a multidimensional framework which includes physiological, psychological and social well-being, as well as satisfaction as a central, core concept (Mapes *et al.*, 2003).

2.12 Dialysis and quality of life

Due to the many daily life restrictions and the relative inefficiency of dialysis to substitute kidney function, dialysis patients all over the world present with a compromised QOL scores (Finkelstein *et al.*, 2009; Santos *et al.*, 2009).

Studies on the outcome of dialysis over time have mainly focused on mortality. These studies suggest that younger patients, those with less co-morbidity, a better nutritional status and a greater small solute clearance have reduced mortality. However, four decades later the dialysis procedure has been largely standardised yet certainly not optimised. Patients still face many physical and emotional challenges as a result of their diagnosis, co-morbid conditions and treatment related side-effects (Tong *et al.*, 2009).

Illness can incapacitate people, destroy lifelong values and commitments, damage social relationships, produce role losses, generate pain and discomfort, result in repeated or continual loss of dignity, force a person to live with debilitating uncertainties, and threaten life itself (Mapes *et al.*, 2003). Families must often cope with a chronically depressed, sometimes aggressive, unemployed relative who must be transported regularly to a possibly distant dialysis centre to receive treatment (Barsoum, 2006). Chronic kidney disease has been defined as provoking a state of prolonged distress (Kaltsouda *et al.*, 2011).

Multiple research papers have reported patients undergoing HD and PD experience QOL deficits (Trbojevic *et al.*, 1998; Merkus *et al.*, 1999; Ginieri-Coccosis *et al.*, 2008; Mazairac *et al.*, 2012). Attention to and focus on QOL is exemplified by the growing number of studies (Mazairac *et al.*, 2012).

Haemodialysis patients on average undergo a minimum of four hours dialysis treatment three times a week. Haemodialysis patients not only face the chronic health problems associated with kidney disease but the invasiveness of a time-consuming therapy. Quality of life in HD patients has shown to be lower than patients with congestive heart failure, chronic lung disease and cancer (Mazairac *et al.*, 2012).

A study by Rodrigues Fructuoso *et al.* (2011) showed improved HRQOL in PD patients when compared to HD patients in scales of effect of kidney disease (73.83 ± 17.89 versus $59.38 \pm 59.38 \pm 18.76$), burden of kidney disease (58.65 ± 27.31 versus 26.35 ± 18.58), and patient satisfaction (84.72 ± 20.67 versus 70.02 ± 20.43). The PD patients were younger (PD: 38.9 ± 13.3 versus HD: 67.3 ± 14.9) and on PD to maintain their active lives and possibility to work or study, whereas the HD group were the older, more sick and dependent persons, limiting the outcome of the study. The study was limited by a small sample size, consisting of 37 HD patients and 14 PD patients (Rodrigues Fructuoso *et al.*, 2011).

A further cross-sectional study involving 874 patients showed no significant differences in HRQOL between PD and HD patients, however, transplanted patients showed an improved QOL. The study was limited by the large difference in patient numbers between HD and PD (HD: 642 versus PD: 65) (Kontodimopoulos and Niakas, 2009). A study by Peng *et al.* (2010) in Taiwan found similar results; no statistical significant difference was found between HD and PD patients in terms of QOL. Once again there was a large difference in the sample between HD and PD patients (HD: 866 versus PD: 301) (Peng *et al.*, 2010).

A secondary analysis of the haemodialysis study (HEMO Study), a randomised control clinical trial consisting of 1813 patients, showed an impaired baseline of HRQOL. It however, found no substantial decline in QOL over three years except for the 70 year and older age group where a decline in HRQOL was noted along with a higher composite event of death within the three year follow-up (Unruh, 2006; Unruh *et al.*, 2008).

Santos *et al.* (2009) reported a European multi-centric study showing a decline only in the physical component of QOL over time, but that the physical and mental aspects presented with no change over a two-year period in a North American cohort single centre study. Haemodialysis patients further showed an improvement in physical functioning and general health after one year (Santos *et al.*, 2009).

A study in Brazil with 144 HD patients reported an improvement in the mental component of HRQOL (from 63.1 to 69) over a two year follow-up, resultant of a psychological adaptation programme. The study was limited by the modest sample size and potential bias because of loss of patients who died. The participants were younger, with a uniformly precarious social profile and few diabetics. It is, however, a typical sample of an underdeveloped area of the globe where infectious diseases are the major health problem and medical assistance to patients with chronic diseases is inadequate (Santos *et al.*, 2009).

Santos *et al.* (2009) further reported a study done in Brazil over a two-year period showing a substantial decline in QOL, but improvement in sub-scales pertaining to the mental component (social functioning, role play and mental health) in the all-sample analysis. The study was limited by the sample size (n=92) and loss of patients because of death may have caused a bias, which is a persistent problem in longitudinal studies of patients with high mortality. Diabetics in this region are known to die from cardiac complications before developing ESKD.

A study by Okpechi *et al.* (2013) in Groote Schuur, Cape Town, South Africa showed no significant difference in HRQOL in HD and PD. However, the study was limited by the small population size of PD patients (n=26) and HD patients (n=56). The study further represents the public patients selected for treatment by health authorities and accounts for less than half of the patients in the centre (Okpechi *et al.*, 2013).

A study done by Mazairac *et al.* (2012) found HRQOL in patients dialysed in a university hospital to be lower than in regional satellite units. The improved QOL score in the regional satellite units has been attributed to geographic access and a reduction in travel time. There is a lack of information on the differences of QOL in centres, however, differences of mortality in dialysis units has been attributed to pre-dialysis care, centres access to transplantation, non-profit versus for profit, and the length of ownership (Mazairac *et al.*, 2012).

Dialysis patients who report reduced general perception of health have nearly a threefold higher risk of hospitalisation and death. Dialysis patients with increased depressive symptomatology have a nearly twofold increase in mortality and a twofold higher peritonitis rate, respectively, than patients who report a lower incidence of symptoms (Finkelstein *et al.*, 2009).

Health-related quality of life has been found to be better in PD patients, particularly in effects of kidney disease, burden of kidney disease, and patient satisfaction (Rodrigues Fructuoso *et al.*, 2011).

The adaption to a chronic illness is a physical, psychosocial and social process. The attention of the health team to the patient's subjective perception about his state of health can be determinant in achieving the best medical intervention and improving survival (Rodrigues Fructuoso *et al.*, 2011).

2.13 Transplantation and quality of life

Transplantation has been associated with a decrease in mortality and the resultant increase in life expectancy (Álvares *et al.*, 2012; Avramovic and Stefanovic, 2012).

Transplantation enables a patient to have a full recovery despite the adverse effects caused by the use of immunosuppressant. This complete rehabilitation has shown to improve the patient's psychological state and overall QOL (Álvares *et al.*, 2012).

A study by Álvares *et al.* (2012) showed no difference in the MCS score (44.46 ± 7.02) of patients transplanted when compared to HD (44.61 ± 7.62) and PD (44.67 ± 8.02) patients in Brazil. However, a significant difference was seen in the PCS; transplantation had the highest score of 47.70 ± 8.64 ($p < 0.001$), followed by HD 42.96 ± 9.62 ($p < 0.001$), and thereafter PD 41.01 ± 9.4 ($p < 0.001$) (Álvares *et al.*, 2012). Similarly, a study by Bohlke (2009) reported the MCS from renal transplant recipients to be similar to the general population, whereas PCS showed lower levels.

A meta-analysis published on 15 prospective transplant studies reported an improvement in HRQOL post-transplant. Increments in the physical dimension of HRQOL were detected in 78%, increases in mental dimension in 85% and in the social dimension in 62% of these studies (Bohlke *et al.*, 2009).

A further trial evaluating the differences in HRQOL among patients on the kidney transplant waiting list while maintained on HD and recipients of kidney transplants found psychological distress to be much higher among patients on maintenance HD (Fiebiger *et al.*, 2004).

Some patients have been found to refuse transplantation and although clinicians should explore the reason behind such decisions to ensure patients are well informed, their decision should be respected. Peritoneal dialysis patients have shown to refuse kidney transplantation less often than HD patients (Avramovic and Stefanovic, 2012).

2.14 Socio-demographic characteristics in relation to quality of life

There has been further interest in the relationship of socio-demographic, social and psychological factors to HRQOL to enable a better understanding of the associated QOL variables (Chan *et al.*, 2012).

Several socio-demographic variables have been associated with QOL and include age, gender, marital status, income, education,

employment and living status (Lopes *et al.*, 2007; Chen *et al.*, 2012).

The DOPPS (2007), consisting of 9526 patients, reported an average age of 59.5 ± 14.8 years. The PCS decreased from younger patients (18 to 29 years) to older patient (>70 years). However, the MCS was found to be relatively similar across the age groups (Table 2.5) (Lopes *et al.*, 2007).

Older age is seen as a contra-indication to dialysis, particularly in a developing country; however, age should not be seen as a contra-indication to dialysis (Avramovic and Stefanovic, 2012). Elderly dialysis patients (>75 years) tend to be more accepting of their disease and accommodating towards dialysis. The QOL of elderly dialysis patients is comparable to the QOL of the general population of the same age group. Social functioning and mental health is comparable between younger and older patients. However, a difference is seen in the PCS between younger and older dialysis patients. Despite the discomfort of dialysis, elderly dialysis patients maintain high QOL scores (Avramovic and Stefanovic, 2012; de Leur *et al.*, 2013).

The DOPPS (2007) has further shown males to have an improved PCS (36.6 ± 10.7) compared to females (34.4 ± 10.8). A lower annual income ($< \$10\ 000$) and high school or less education showed reduced MCS scores (43.5 ± 12 and 44.3 ± 11.9). In addition, the DOPPS has shown living in a nursing home is associated with a reduced PCS score (30 ± 9.3) (Table 2.5) (Lopes *et al.*, 2007).

Patients who are employed have shown improved QOL (Álvares *et al.*, 2012). This is demonstrated in the DOPPS (2007) where both the PCS and MCS were significantly lower in the unemployed dialysis group compared to the employed dialysis group (Table 2.7).

Table 2.7 Health-related quality of life scores by selected patient characteristics (Lopes *et al.*, 2007).

Characteristics	Levels	PCS	MCS
Age **	18–29***	43.3 ± 9.4	44.8 ± 11.5
	30–49	39.5 ± 10.5^c	44.8 ± 11.8
	50–59	36.7 ± 10.6^c	45.1 ± 11.8
	60–69	34.2 ± 10.4^c	44.5 ± 12.1
	≥70	32.3 ± 10.0^c	44.7 ± 11.8
Sex	Male (ref)	36.6 ± 10.7^c	44.4 ± 12.0
	Female	34.4 ± 10.8	45.0 ± 11.8
Marital status	Married (ref)	35.9 ± 10.6	44.5 ± 11.8
	Not married	35.4 ± 10.9 ^a	45.0 ± 11.9
Yearly income	≥\$10,000 (ref)	35.9 ± 10.8	45.3 ± 11.8
	<\$10,000	35.2 ± 10.6 ^b	43.4 ± 12.0^c
Education	Attended college (ref)	36.3 ± 10.8	46.9 ± 11.5
	High school or less	35.5 ± 10.8 ^a	44.3 ± 11.9
Occupation status	Employed (ref)	42.6 ± 9.4	46.6 ± 11.3
	Unemployed	34.5 ± 10.5^c	44.1 ± 11.9
Living status	Living w/family or friends (ref)	35.9 ± 10.8	44.8 ± 11.8
	Living alone	35.7 ± 10.8	44.5 ± 12.1
	Living in nursing home	30.0 ± 9.3^c	45.1 ± 13.1
	Homeless/prisoner	36.6 ± 11.8	46.6 ± 12.2

*The bold text represents the differences that remained significant after correcting for multiple corrections.

2.15 Clinical manifestations of chronic kidney disease in relation to quality of life

Despite therapies and technologies which have reported an improvement in QOL in CKD patients, CKD patients remain substantially burdened by limited functioning and dialysis-related symptoms. The uraemic syndrome found in CKD patients resembles systemic poisoning with multiple complications and side effects (Vanholder and Ringoir, 1992). Dialysis only partially rehabilitates a patient. Both PD and intermittent haemodialysis (IHD) has shown to be equivalent to only 15% kidney function, whereas short daily haemodialysis (SDHD) is equivalent to 25% and home nocturnal haemodialysis (HNHD) 40% (Figure 2.12) (McFarlane, 2009).

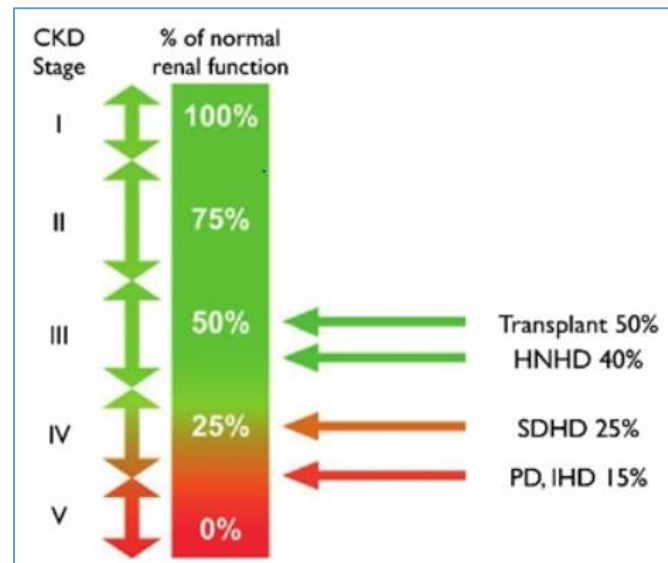


Figure 2.12 Urea clearance with renal replacement therapy relative to kidney function (McFarlane, 2009).

Clinical factors such as dialysis adequacy, anaemia, nutritional management and the presence of co-morbidity have shown to influence HRQOL (Chan *et al.*, 2012).

Malnutrition is common in dialysis patients and has been associated with increased mortality and decreased quality of life. Albumin has been reported to be directly related to general health. No significance was reported between albumin and PCS and MCS in a study by Oliveira *et al.* (2012). However, the DOPPS (2007) reported an association between lower albumin (<3.5g/dL) levels and a reduced PCS (32.4 ± 10.4) (Table 2.8) (Lopes *et al.*, 2007).

The management of anaemia with the administration of ESAs and iron supplementation has shown to improve the well-being and mental capabilities of the uraemic patient. Improvements in physical activity, vitality and fatigue have been reported in patients maintained within the targeted range of haemoglobin and iron (Avramovic and Stefanovic, 2012). Despite the reported benefits, the DOPPS (2007) failed to show improved QOL scores within the targeted range. Furthermore, the DOPPS has shown a lower PCS (33.1 ± 10.9) to be associated with a lower systolic blood pressure (<110mmHG) (Table 2.8) (Lopes *et al.*, 2007).

Table 2.8 Health-related quality of life score in relation to biochemical variables.

Characteristics	Levels	PCS	MCS
Serum Albumin (g/dL)	≥3.5 (ref)	36.5 ± 10.7	44.8 ± 11.7
	<3.5	32.4 ± 10.4^c	44.4 ± 12.4
Hemoglobin (g/dL)	≥11 (ref)	35.6 ± 10.9	45.0 ± 11.8
	9–11	36.1 ± 10.7	44.8 ± 11.9
	<9	36.3 ± 10.6 ^a	44.0 ± 11.8
Équilibrated Kt/V	≥1.2 (ref)	35.4 ± 10.7	44.8 ± 11.9
	<1.2	37.3 ± 10.8^c	44.6 ± 11.7
Vascular access	Fistula or graft (ref)	36.7 ± 10.7	44.7 ± 11.7
	Catheter	32.0 ± 10.3^c	44.9 ± 12.3
Predialysis SBP(mm Hg)	>140	36.1 ± 10.7	44.9 ± 11.8
	140–110 (ref)	35.6 ± 11.0	44.6 ± 11.8
	<110	33.1 ± 10.9^c	44.4 ± 12.9

*The bold text represents the differences that remained significant after correcting for multiple corrections.

A study by Clearly (2005) reported no significant difference in the PCS of patients who underwent haemodialysis and had a Kt/V >1.2 and those who had a Kt/V <1.2. There was, however, a significant difference in MCS. Patients who were better dialysed (Kt/V>1.2) had significantly lower MCS compared to those with a Kt/V <1.2. The DOPPS (2007), however, reported an improved PCS with a Kt/V<1.2, but did make reference to its relation to mortality. Catheter usage was further reported by the DOPPS (2007) to be associated with a reduced PCS (32±10.3) (Table 2.8) (Lopes *et al.*, 2007).

Quality of life has shown to be improved in PD patients with a Kt/V greater than 2. However, in a study by Chen *et al.* (2012), this improvement is already seen in Kt/V's over 1.2. The improvement was specifically found in the domains of general health, physical function and role limitation due to physical problems at six months after the initiation of PD. The study however does not relate the lower Kt/V score to mortality (Chen *et al.*, 2012).

The Netherlands Cooperative Study on the Adequacy of Dialysis (NECOSAD) found that the physical QOL over time in HD patients is better than in PD patients, with the mental QOL remaining similar between groups. However, Ginieri-Coccosis *et al.* (2008) reported that HD patients seem to experience a higher level of adverse symptoms, including insomnia and anxiety, during the initial years of dialysis therapy as opposed to PD patients who show an insignificant variation of QOL over time. PD patients also had a higher rating in perceived ability to travel, financial concerns and dialysis access, and increased satisfaction with their healthcare. However, the data was limited by the lack of associated to clinical

results and the PD group did not have a large difference in terms of length of treatment.

2.16 Co-morbidities and health-related quality of life

The presence of co-morbidities has shown to further reduce QOL in CKD patients (Avramovic and Stefanovic, 2012; Chen *et al.*, 2012). This is significant as Avramovic and Stefanovic (2012) have reported that 64% of patients commencing dialysis have a moderate or severe co-morbidity index score, indicating a high burden of disease.

The DOPPS (2007) reported a reduced PCS and MCS for patients with the presence of co-morbidities, including cerebrovascular and cardiac disease, peripheral vasculopathy and diabetes (Table 2.9).

Table 2.9 Co-morbidities and health-related quality of life.

Characteristics	Levels	PCS	MCS
Comorbidities	Absence (ref)	41.3 ± 9.8	46.1 ± 11.4
	Cerebrovascular/neurologic	31.2 ± 10.2^c	43.6 ± 11.8
	Cardiac disease	33.2 ± 10.4^c	44.5 ± 11.9
	Peripheral vasculopathy	30.6 ± 9.9^c	44.0 ± 12.4
	Diabetes	32.5 ± 10.2^c	44.7 ± 12.8

*The bold text represents the differences that remained significant after correcting for multiple corrections.

Health-related quality of life is impaired in CKD patients. Potentially modifiable factors have been reported; therefore, it is critical for health teams to understand the subjective perception of health from the patient's perspective to enable the best medical intervention and care in an area characterised by poor clinical outcomes (Rodrigues Fructuoso *et al.*, 2011).

2.17. Conclusion

While there is a considerable amount of published data on QOL, there is paucity of data in developing countries, where dialysis is only available to the minority of people with end stage kidney failure. Therefore if dialysis is being provided, it should be ensured that it is providing the best possible benefit to those lucky few and that it improves not only the number of life years but QOL. Quality of life has been reported to be an equally important marker in the evaluation of treatment outcome in chronic disease, particularly in dialysis in a number of studies as outlined above for people on dialysis and for those with chronic illnesses.

Taking these facts into account it was therefore the aim of this study to investigate the QOL of chronic dialysis patients in a

developing country like South Africa which has limited resources and does not provide equal access to all for those with end stage kidney failure. This study it is hoped will allow for a more comprehensive understanding by clinicians of the importance of QOL issues to this patient group and with the hope that the results can then be used to improve patients care in the future.

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Chapter 3 Methodology

3.1 Methodological approach

Recent investigators and patients alike have argued the importance of subjective measures, especially quality of life (QOL), being incorporated as an equally important measure of treatment and outcome. This has shown to be particularly important in chronic medical conditions, such as chronic kidney disease (CKD) (Fayers and Machin, 2007; Mucsi *et al.*, 2008; Boini *et al.*, 2011).

3.2 Study site

The research was conducted at 11 dialysis units encompassing both the public and private healthcare sector (Figure 3.1). Dialysis units in Gauteng and Limpopo were used in the study and included:

- National Renal Care (NRC): Benoni
- NRC: Mayfair
- NRC: Arcadia
- NRC: Parktown West
- NRC: Olivedale
- NRC: Sunninghill
- NRC: Sunward Park
- NRC: Alberton
- NRC: Venda
- Helen Joseph Hospital: Johannesburg
- Baragwanath Hospital: Soweto



Figure 3.1 Research locations.

Note: Ten dialysis units were within the Gauteng region and one in the Limpopo region.

3.3 Study design

A non-experimental research design was applied with mixed methodologies of qualitative and quantitative methods (Figure 3.2). Utilisation of a mixed methodology was used to enhance the interpretation of the data and provide the most informative, complete and balanced research results (Frels and Onwuegbuzie, 2013). Previous research indicated that it is the most effective strategy to explore experiences and their meanings (Serber and Rosen, 2010).

The quantitative methods applied encompassed a descriptive design applied to gather more information on the variables related to the health-related quality of life (HRQOL) on chronic dialysis patients (n=200), within their natural setting, the dialysis unit.

A comparative descriptive study was applied to describe variables of the total chronic dialysis patient sample (Group A; n=200) as well as the differences among the two subdivided groups based on treatment modality, the chronic haemodialysis (HD) patient group (n=100) and the peritoneal dialysis (PD) patient group (n=100). The total dialysis sample (n=200) was further compared to the nephrology professional's perspective on HRQOL (Appendix E).

Qualitative methods encompassed a phenomenological study applied to report the 'lived experiences' represented by the quality of life survey (Appendix C) and the chronic dialysis patient questionnaire (Appendix B) of the chronic dialysis patients (n=200).

Dialysis patient questionnaires (Appendix B) and QOL questionnaires (Appendix C) were collected, and biochemical results (Appendix D) recorded.

Both prospective and retrospective data was utilised. Prospective data, which included 65% of the data (n=130) was collected for patients meeting the inclusion and exclusion criteria during the study duration (July 2010 - July 2013) where no previous questionnaires were completed (Appendix B and C). The retrospective data, 35% of the data (n=70) included data from 2008. In addition, the nephrology practitioner's questionnaire (Appendix E) was collected, following a pilot study of the questionnaire. Informed consent was obtained from the participants and the required information collected accordingly. Retrospective data was utilised where patients had previously completed the questionnaires (Appendix B and C) and had existing biochemical analysis.

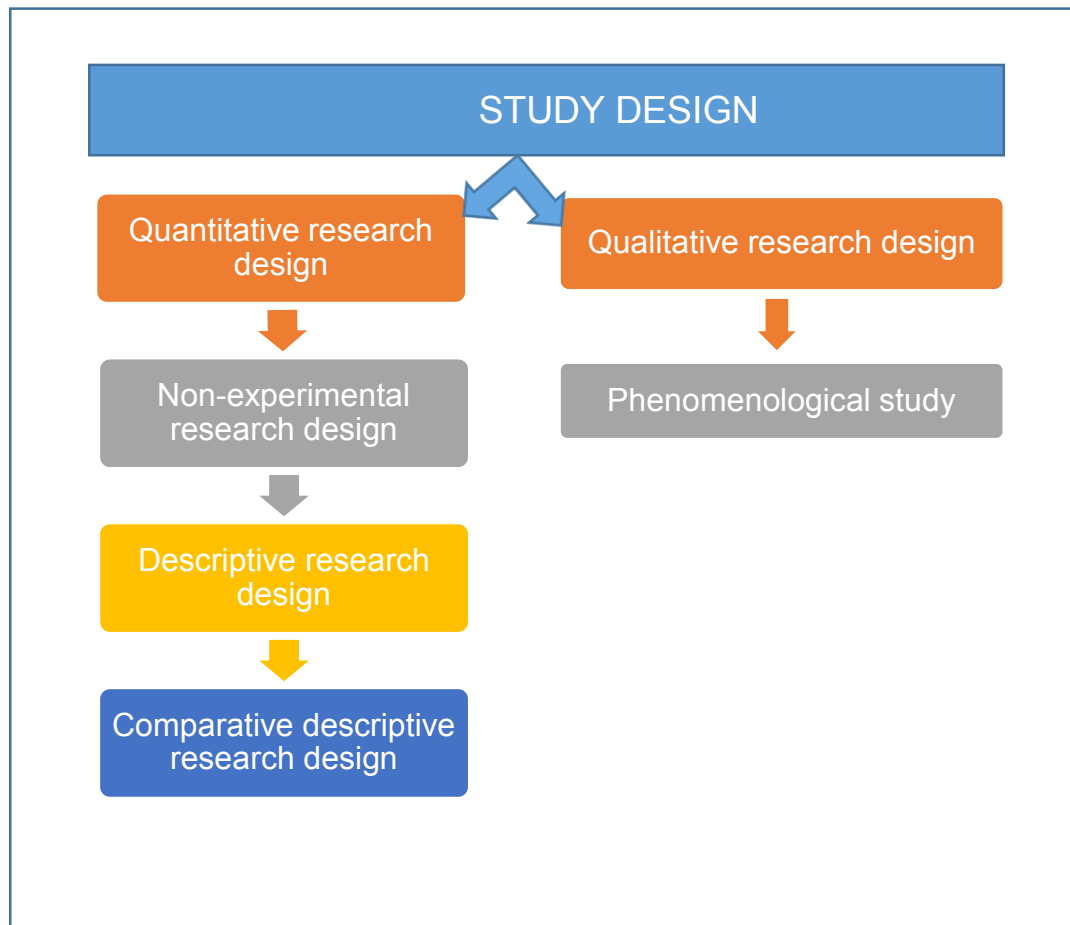


Figure 3.2 Diagrammatic representation of the study design.

3.4 Study layout

Figure 3.3 represents a summary of the layout of the research design.

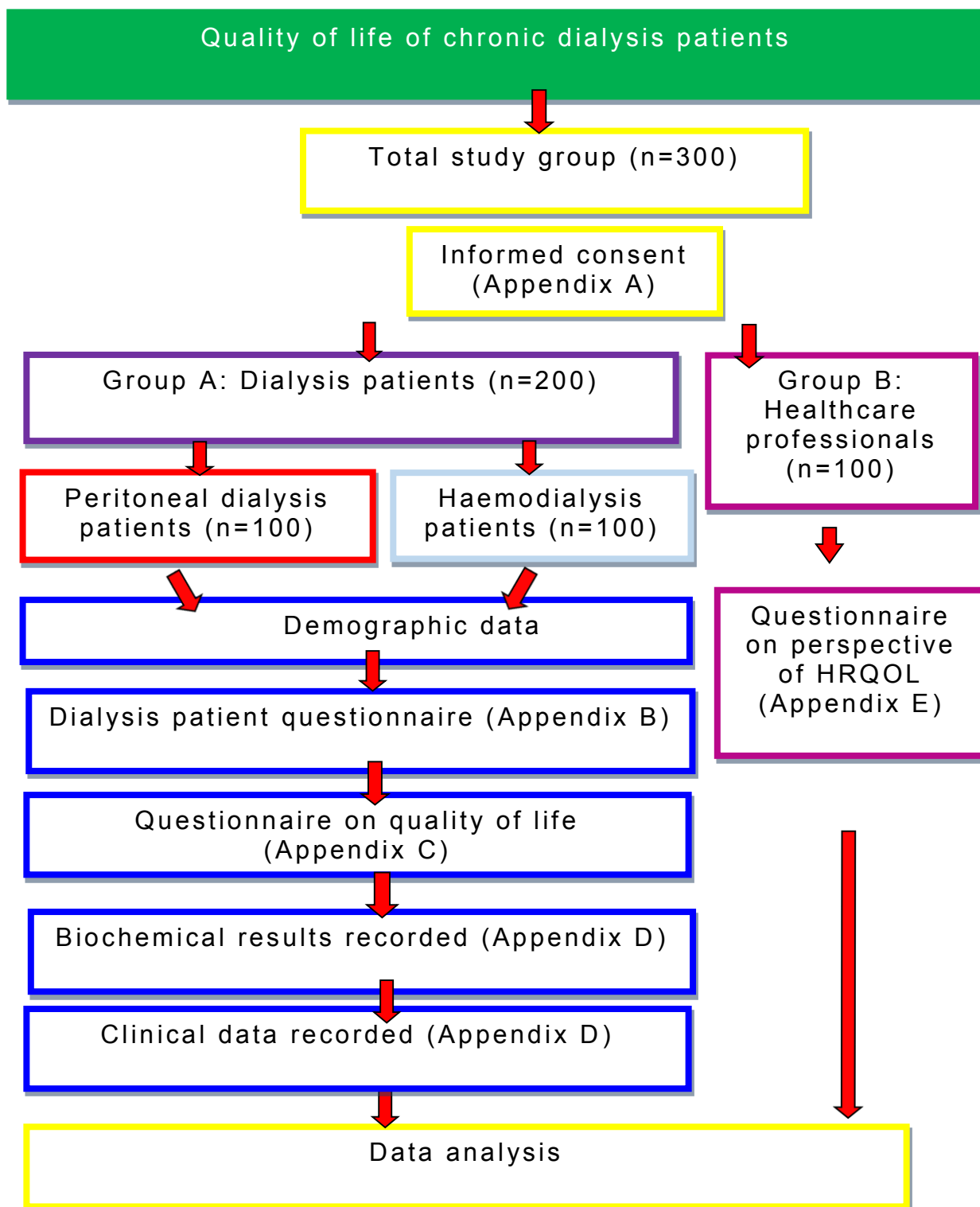


Figure 3.3 Diagrammatic representation of the layout of the research design.

3.5 Study population

One hundred (n=100) chronic HD patients and 100 (n=100) PD patients were randomly selected from the 11 dialysis units across Gauteng and Limpopo. Patients were selected from both public and private dialysis units and constituted group A (n=200).

The sample included end stage kidney disease (ESKD) patients who have been on dialysis for a minimum period of 90 days.

Group B (n=100) consisted of nephrology practitioners, who were randomly selected for the completion of the survey regarding the impact of ESKD. The nephrology practitioners included clinical technologists and registered nurses who specialised in nephrology, as well as nephrologists consulting within National Renal Care (NRC) units and the 11 units across Gauteng and Limpopo that were selected for the research project (3.5.1).

3.5.1 Inclusion criteria of Group A

- Kidney failure patients
- Patients on chronic HD for > 3 months
- Patients on chronic PD for > 3 months
- Diabetic patients who present with kidney disease
- Hypertensive patients who present with kidney disease
- ESKD patients on diuretics
- Receive treatment in the Gauteng and Limpopo region
- Between the age of 18 and 80 years
- Male and females
- All race groups
- Patients who provide their consent for prospective data collection
- Healthcare professionals (nurses, clinical technologists and nephrologists) specialising in nephrology

3.5.2 Exclusion criteria of Group A

- Individuals who do not provide their consent
- Patients undergoing alternative therapies and not HD or PD
- Patients who develop acute kidney failure, which does not lead to ESKD requiring dialysis because of regained kidney function
- Pregnant women

3.5.3 Justification for inclusion and exclusion criteria

An individual was required to give his/her consent prior to participating in the prospective study. Consent was not deemed to

be a requirement by the ethics committee for the collection of retrospective data however despite this where it was possible for consent to be obtained from patients who were able to provide consent it was acquired.

All ESKD patients from any population group from Gauteng and Limpopo met the inclusion criteria.

The exclusion criteria eliminated patients who developed acute kidney failure, but regained kidney function. Pregnant women were excluded from the study and patients undergoing alternative therapies (for example, acute dialysis) were excluded as this particular research focused on chronic HD and PD patients.

3.5.4 Sample size

After consultation with a mathematical statistician at the Medical Research Council (MRC) it was determined that a sample size of 200 for Group A (Group A; n=200) and 100 for Group B (n=100) would be adequate for a multiple regression analysis. Ten factors for the bivariate analysis between the HRQOL score and individual factors were adequate. Factors included in the multiple regression analysis were those with $p < 0.15$ in the bivariate analysis.

3.5.5 Subject identification

The patients of Group A were identified by a numerical value (001-200). Group B (nephrology practitioners) were identified by an N followed by a numerical value (N001-N100). For publication purposes, the last number will be published to protect the patient's identity.

3.5.6 Withdrawal criteria and drop-outs

Any participant in the study could withdraw, of his/her own free will, at any time within the study without it being held against him/her or experiencing any consequences. Their treatment, where applicable, would continue as prescribed by the consulting nephrologist.

All participants who withdrew from the study would not be replaced and would be referred to as "drop-outs".

No drop-outs were reported throughout the duration of the study.

3.6 Data collection

3.6.1 Method of data collection

At study entry, a medical questionnaire consisting of baseline patient details and information (Appendix B) was completed by the

researcher or unit coordinator in the specific dialysis unit. The unit coordinator was trained by the researcher to ensure standardisation of data collection.

Random sampling was performed on 100 HD patients (n=100) and 100 PD patients (n=100) from 11 dialysis units in South Africa.

All patients were screened to identify chronic kidney failure patients who were on dialysis for longer than 90 days.

The patients and their data were then weighed against the inclusion (3.5.1) and exclusion criteria (3.5.2.) prior to commencement of the research project. The nature of the research was described and discussed with the patient, who was then required to sign a consent form (Appendix A).

One hundred HD patients (n=100) and 100 PD patients completed the SF-36 questionnaire (Appendix C) by self-reporting and a pencil and paper survey. This technique has proved to minimise disparities between the informant and patient ratings of HRQOL (Unruh, 2006). Several studies have shown that independent assessments by either healthcare professionals or patients' relatives differ from the responses obtained when patients complete self-reported questionnaires (Unruh, 2006; Fayers and Machin, 2007).

All medical data (Appendix D) was collected within 30 days of completion so as to reduce the probability of important changes in patient characteristics from the time of completion of the medical questionnaire and the time of collection of HRQOL data (Appendix C).

3.6.2 Questionnaires

The investigations for group A (n=200) were subdivided into three groups:

- The dialysis patient questionnaire, which included the patient's demographics and medical history (Appendix B)
- The questionnaire on quality of life (Appendix C), and
- The biochemical and clinical variables (Appendix D) in the chronic dialysis patient sample.

The questionnaire for Group B (n=100) included the perspective of the healthcare professional on HRQOL (Appendix E).

3.6.2.1 Dialysis patient questionnaire

The dialysis patient questionnaire (Appendix B) included patient demographics, primary diagnosis, and presence of co-morbidities,

previous medical history, treatment and knowledge of disease (Appendix B).

The demographic variables included were age, sex, race, occupation, employment status, activity level, distance from dialysis units, spiritual relationship, and family medical history (Appendix B).

3.6.2.2 Health-related quality of life

One of most used generic HRQOL instruments is the Medical Outcomes Study 36-Item Short-Form Health Survey, SF-36 (Appendix C). The SF-36 assesses eight generic scales of HRQOL. Two composite measures, the physical component summary (PCS) and the mental component summary (MCS), are derived from the eight scales (Lopes *et al.*, 2007).

The Kidney Disease Quality of Life Short Form (KDQOL-SFTM) was developed to take into account particular concerns of patients with kidney diseases and ESKD. This HRQOL instrument combines the 36 generic items of the SF-36 with 43 kidney disease targeted items. Eleven scales are defined from the kidney disease targeted items, resulting in a total of 19 scales (Lopes *et al.*, 2007).

The SF-36 questionnaire (Appendix C) is a multidimensional, reliable and validated questionnaire specifically designed for dialysis patients. Reliability of the SF-36 has been estimated previously over a wide range of health problems using both internal consistency measures (Cronbach's alpha and inter-item correlations) and test-retest methods. Overall reported alpha internal consistency coefficients generally exceeded 0.7 and in most cases exceeded 0.8, the two week test-retest correlations were reported between 0.6 and 0.8, and the internal consistency of the eight scales ranged from 0.82 to 0.92 (Cleary, 2005). Therefore, the SF-36 questionnaire was used in the determination of HRQOL in the research project.

General socio-demographic characteristics were incorporated into the questionnaire to enable the investigation of associated variables (Appendix B).

3.6.2.3 Biochemical and clinical analysis

The biochemical analysis included: urea, creatinine, electrolytes, magnesium, phosphate, calcium, parathyroid hormone, iron studies, haemoglobin, and cholesterol and dialysis adequacy (Appendix D).

In the completion of the biochemical assessment the pathology laboratories, Ampath, Lancet and the government pathology

laboratories were used to obtain the biochemical analysis, which was subjected to the laboratories quality control.

The clinical assessment included the assessment of the patient's weight and weight gain (Appendix D).

3.6.2.4 Nephrology practitioner

The perspective of nephrology healthcare professionals on ESKD was evaluated through a simple survey related to the impact of ESKD and the level of knowledge of a dialysis patient (Appendix E).

3.7 Data analysis

3.7.1 Clinical interpretation

According to Hays and colleagues (1995), a Cronbach's alpha reliability coefficient provides an indication of the degree of convergence between different items hypothesized to represent the same construct or trait. A reliability level of 0.7 has been advocated as a minimum standard for measurement that is used to compare different groups of people. A greater reliability of 0.9 is recommended as a minimum in order to interpret the score at the individual level (Hays *et al.*, 1995).

A Cronbach's alpha level of 0.9256 has been obtained for the datasheet and therefore the results of the study were reported as single items, as well as in related domains. The total dialysis population (n=200) was analysed as an entity and thereafter separated based on modality (group A); haemodialysis (n=100) versus peritoneal dialysis (n=100). Thereafter, the data was further analysed in relation to the 100 nephrology practitioners (n=100; group B).

3.7.2. Statistical analysis

The study set out to determine the relationship between socio-demographic and modifiable variables, PESKD and education with HRQOL expressed as a score from the SF-36 questionnaire.

A statistician from the biostatistics unit at the Medical Research Council was consulted regarding the sample size being representative and the statistical analysis of the research project.

The associations of interest were primarily assessed using regression techniques and simple and multiple linear regressions. Furthermore, the associations between patients' and professionals' perception of patient QOL were assessed using McNemar's test for symmetry. Testing was done at the 0.05 level of significance. The data summary included the use of descriptive statistics (mean,

standard deviation, median) and the range for continuous parameters, while the categorical parameters were made up of frequency, percentage and cross tabulation.

The HRQOL was determined using the KDQOL-36™ scoring programme (V2.0), which is a SAS programme in an Excel spreadsheet used to create scores and produce descriptive statistics for the KDOQI-36 measures, including the SF-12 composites.

The SF-36 scores were constructed using the Likert method of summated ratings. Answers to each question were scored and then summarised to produce raw scale scores for each health concept, and thereafter transformed to a 0-100 scale with higher scores indicating better physical and mental functioning and freedom from pain (Cleary, 2005). Scoring algorithms were then applied to produce the PCS and MSC scores. The two generic summary scores (i.e., MCS and PCS) of the SF-36, which were derived from eight scales of the SF-36: physical functioning, role-physical, bodily pain, general health, vitality (energy/fatigue), social functioning, mental health (emotional well-being) and role-emotion derived from the patients' responses (Lopes *et al.*, 2007).

Linear mixed models were used to compare the scores of the HRQOL measures between groups of patients with different characteristics.

To estimate adjusted differences in scores, regression models were used and included the following covariates: age, gender, race, occupation, employment status, distance from renal unit, living status, dialysis dose, number of access placements, PESKD, frequency of therapy, choice of treatment, presence of co-morbidities, level of knowledge regarding individual parameters in the management of ESKD, and recorded biochemical results.

A p-value < 0.05 was considered statistically significant (Lopes *et al.*, 2007).

3.8 Quality assurance

3.8.1 Good clinical practice

All clinical work conducted in this research project was in accordance with the ethical principles which have their origins in the Declaration of Helsinki (2002) and are consistent with good clinical practice guidelines.

The Declaration of Helsinki's basic principle number 3 states that research should be conducted only by scientifically qualified persons (World Medical Association Declaration of Helsinki, 2002).

Therefore, the whole research project was compiled by the researcher, a registered Clinical Technologist (registered with the Health Professional Council of South Africa, number KTG 0008087), under the supervision of two qualified study leaders.

Three fundamental ethical principles were followed throughout the study: respect for persons, beneficence, and justice. Privacy, anonymity and confidentiality were maintained throughout the study.

3.8.2 Ethics committee

Ethical approval was granted for the project (reference number 10050001 from Pharma-Ethics).

3.8.3 Subject information and informed consent

Every patient who was requested to take part in the study was informed regarding the nature of the research, the information required for the study, their role in the study, the financial implications, as well as the ability to withdraw from the research study at any time without any consequences of any nature. They would be required to sign a consent form, agreeing to participate in the study of their own free will (Appendix A).

3.8.4 Safety variables

The research project was completely safe; there were no adverse effects resulting from it. The blood results that were used in the study were derived from standard unit protocols and were recommended by the South African Renal Society (SARS) as guidelines for optimal care of patients on chronic dialysis in South Africa (2006). No additional blood testing was done. The blood testing was not done for the sole purpose of the research project and therefore it had no additional implications for the research participants as routine biochemical analysis is a part of the dialysis prescription.

3.8.5 Premature discontinuation of the study

Prior to the commencement of the study it was decided that the study would be discontinued prematurely if the researcher or any one of the supervisors felt that a patient's confidentiality might be jeopardised or if any unethical procedures occurred.

3.8.6 Accuracy of data and data analysis

All the data was evaluated at the time of downloading onto the database. All data was recorded by the researcher herself and further analysed during the statistical analysis of the research. The

statistical analysis was completed by Prof. Piet Becker at the Medical Research Council.

The internal consistency of the data sheet produced a Cronbach's alpha score of 0.9236.

3.8.7 Confidentiality

The confidentiality of the study was of utmost importance. The patient's identity was not made known to any individual to whom the patient had not provided their consent too. All records and patient information remained confidential.

3.9 Financial implications

The study had no additional financial implications for the research participants as no additional biochemical analysis and evaluations were conducted. The biochemical analysis and clinical evaluations used in the research were a part of the prescribed dialysis treatment regimen.

Chapter 4 Results

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Chapter 4 Results

4.1 Patient demographics

A total of 200 patients, who met the inclusion criteria (3.5.1), were included in the analysis. Ninety five percent (95%) of the sample (n=190) were from the private sector and only 5% (n=10) from the public healthcare sector. When categorising the groups by age, the majority of the in-centre haemodialysis (HD) patients (26%) fell into the age range of 51 to 60 years. In contrast, for the at home peritoneal dialysis (PD) patients the majority (25%) were younger, falling into the age range between 41 to 50 years (Figure 4.1). However, the mean age for the HD group was 49 ± 15 years, whereas for the PD group it was significantly older at 53 ± 14 years ($p=0.043$). The age evaluation for the total dialysis patient sample (n=200) revealed a mean age of 51 ± 15 years of age.

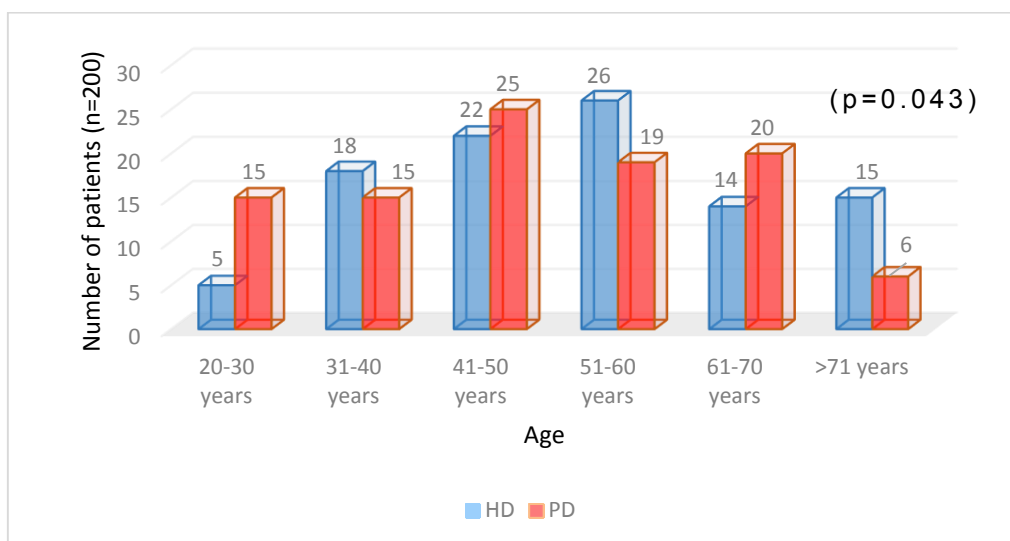


Figure 4.1 Graphical representation of the age distribution of the total sample (n=200).

When looking at gender, both HD and PD patient groups had an equal percentage of male and female patients. Females were only slightly fewer, constituting 48% and males 52% of the sample (n=200) (Table 4.1).

The racial make-up of the group (n=200) showed that the majority of the study population were white in both dialysis groups (HD: 55%; PD: 68%), followed by black (HD: 31%; PD: 24%), and coloured

(HD: 14%; PD: 8%) patients (Table 4.1). The study was open to all race groups, but only data of the three race groups fell within the inclusion criteria (3.5.1) which resulted in no people of Indian descent unfortunately not being included into the study population. The explanation for this may be that the units included in the study had relatively small number of patients of Indian descent on dialysis, which is reflective of the society in general.

The majority of the patients overall and in both patient groups were employed full-time (HD: 37%; PD 42%) (Table 4.1).

No significant differences were found between the HD and PD patient groups for gender, race and employment status (Table 4.1).

Table 4.1 The patient demographics of the total dialysis sample (Group A; n=200).

Patient demographics	HD (n=100)	PD (n=100)
Age (years)	%	%
20-30	5	15
31-40	18	15
41-50	22	25
51-60	26	19
61-70	14	20
>71	15	6
Gender		
Male	52	52
Female	48	48
Race		
White	55	68
Black	31	24
Coloured	14	8
Employment		
Full-time	37	47
Part-time	2	0
Self-employed	5	5
Unemployed	32	21
Retired	24	27

In the table below (Table 4.2), the majority of PD patients were white (68%) with a mean age of 51 ± 16 years, followed by black patients (24%), who were younger (mean age 46 ± 13 years). Coloured patients were in the minority (8%) with a mean age of 44 ± 14 years.

The majority of HD patients were white patients (55%) with a mean age of 55 ± 15 years, followed by black patients (31%) with a mean age of 48 ± 12 years. The coloured patients were once again in the minority with 14% and a mean age of 54 ± 10 years (Table 4.2).

Table 4.2 The mean age and race for the total dialysis sample.

Race	PD (n=100)			HD (n=100)		
	Race (%)	Mean age	Std	Race (%)	Mean age	Std
White	68	51	16	55	55	15
Black	24	46	13	31	48	12
Coloured	8	44	14	14	54	10

On assessing the time taken to access dialysis a significant difference ($p=0.01$) was found between the HD and PD patient groups with regard to the distance travelled to the dialysis unit from their home. However, on looking at both dialysis modalities the majority of patients lived within 20km of the dialysis unit (HD: 57%; PD: 52%). However, 33% of PD patients had to travel distances greater than 41km, compared to those patients on HD (16%) (Figure 4.2), and this difference was statistically significant; $p = 0.01$.

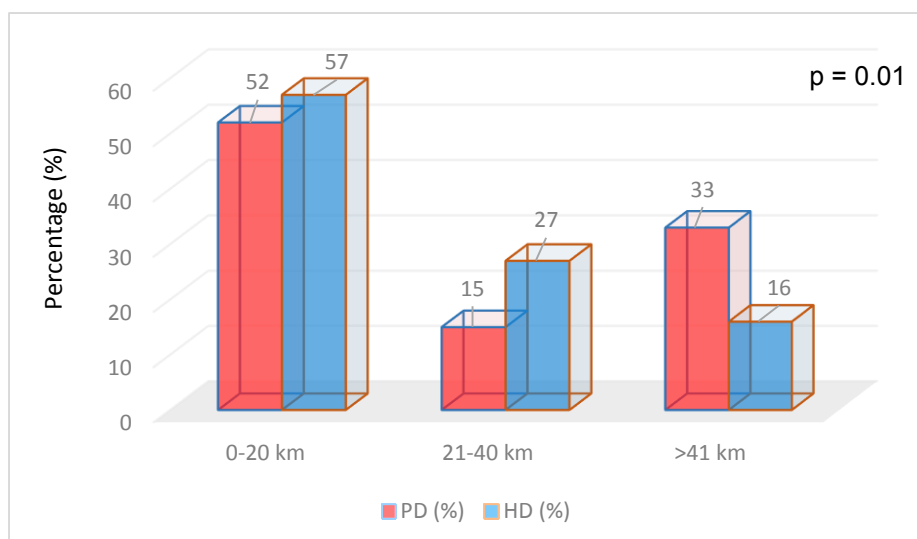


Figure 4.2 Graphical representation of the distance travelled to the dialysis unit (n=200).

4.2 Aetiology of chronic kidney disease

Hypertension was the leading cause of chronic kidney disease (CKD) in the study population; this was quite similar by dialysis modality, being 26% of in-centre HD and 28% of at home PD patients. Following hypertension as the cause of ESKD was diabetes. Seventeen percent (17%) of HD patients and 26% of PD patients had diabetes. Six percent (6%) of HD patients and 9% of PD patients had adult polycystic kidney disease (APKD). Similarly, 6% of HD patients and 8% of PD patients were labelled as having glomerulonephritis, but the number who had the diagnosis confirmed by renal biopsy was not known. The remaining causes of ESKD in this population are categorised as 'other', and included analgesic nephropathy, reflux nephropathy, and lupus nephritis. The cause of renal failure of a large group of patients was not known; therefore they were categorised as 'unknown cause' (Figure 4.3).

No significant difference was found in the aetiology between the two dialysis modality patient groups (Figure 4.3).

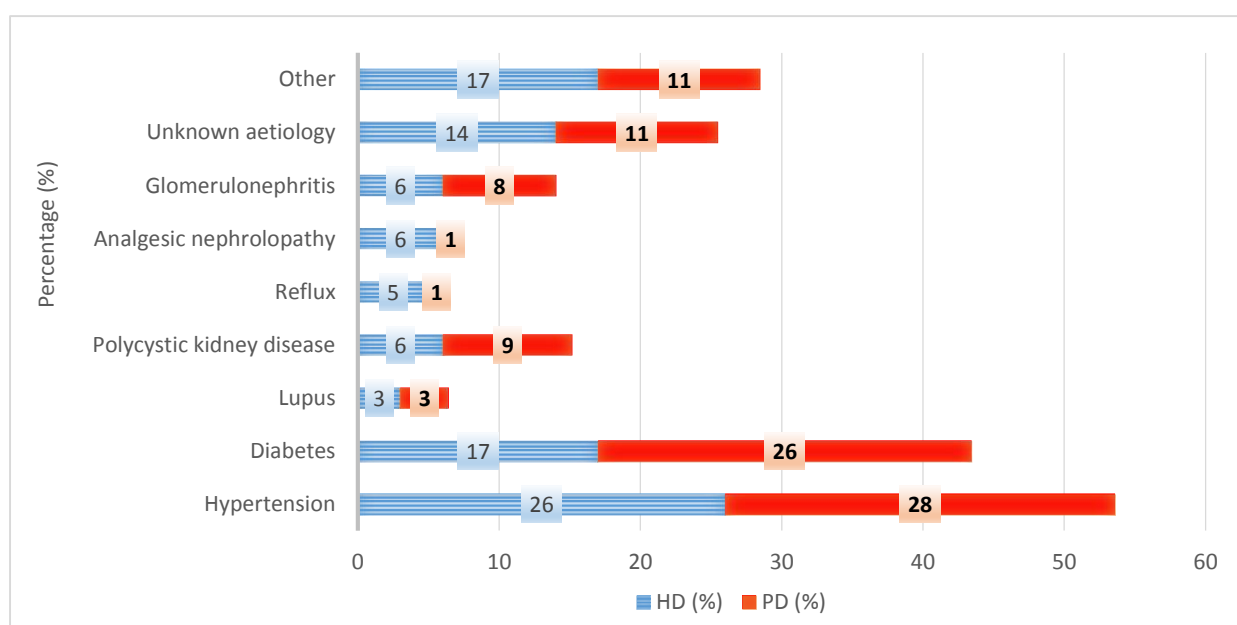


Figure 4.3 Graphical representation of the aetiology of chronic kidney disease (n=200).

4.3 The prevalence of co-morbid disease in the dialysis patient

The prevalence of co-morbid disease (diabetes, hypertension and cardiovascular disease) in dialysis patients is shown in the table below (Table 4.3). There was a marginal significant difference in

the prevalence of hypertension ($p = 0.06$) between the two groups, i.e. HD and PD, but not for diabetes ($p=0.7$). However, cardiovascular disease was significantly more prevalent in the PD group (47%) compared to the HD group (20%) ($p<0.001$).

Table 4.3 The presence of co-morbidity in the dialysis sample.

Co-morbidity	PD (%)	HD (%)	p-value
Diabetic	27	25	0.70
Hypertension	61	75	0.06
Cardiovascular disease	47	20	<0.001

4.4 Pre-end stage kidney disease management

The figure below (Figure 4.4) represents the total percentage of in-centre HD and at home PD patients (Group A; $n=200$) who were aware of their kidney disease prior to commencing dialysis or in whom their kidney disease was being managed by a nephrologist or physician before being initiated on dialysis. This graph also includes the percentage of patients who participated in a pre-end stage kidney disease (PESKD) management programme and therefore could be classified as being early referral patients, as they were known for >3months on the PESKD programme before starting dialysis.

As represented below (Figure 4.4), 72% of the PD patients and 31% of HD patients were aware of their kidney disease. In addition, 65% of PD patients but only 20% of HD patient's kidney disease were managed by a nephrologist or physician prior to commencing dialysis. HD patients were also much less likely to have participated in a PESKD management programme, with only 11% of HD patients having participated, whereas 52% of PD patients participated in the programme (Figure 4.4) ($p<0.001$).

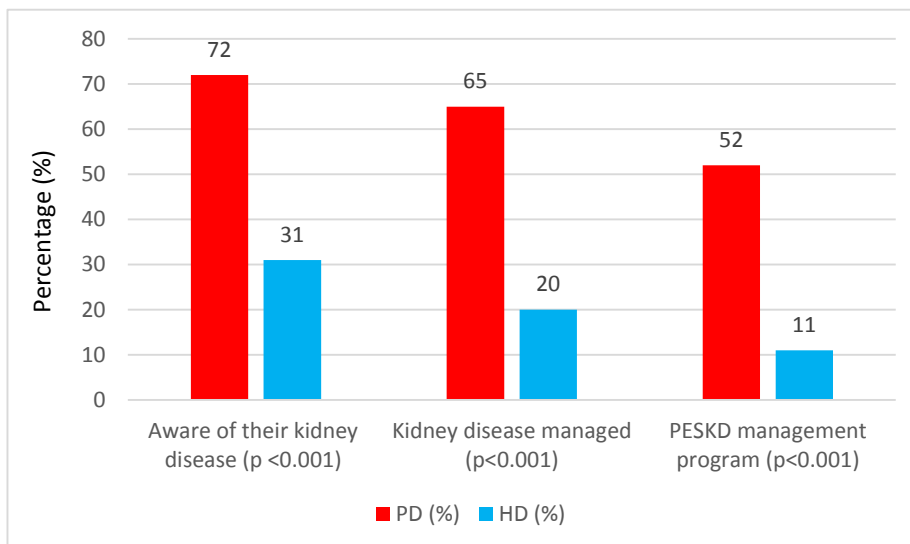


Figure 4.4 Graphical representation of the awareness and management of kidney disease and PESKD management (n=200).

Taking into account the impact of PESKD, the figure below (Figure 4.5) represents the percentage of patients who were presented with all the available treatment options for RRT and those who chose their treatment modality. Here again, participating in a PESKD resulted in the majority of PD patients (97%) having been informed of all available therapies, i.e. HD, PD and transplantation. In this group of 97% of PD patients, 95% of patients chose their treatment, compared to only 41% of HD patients who chose their dialysis treatment modality (p<0.001) (Figure 4.5).

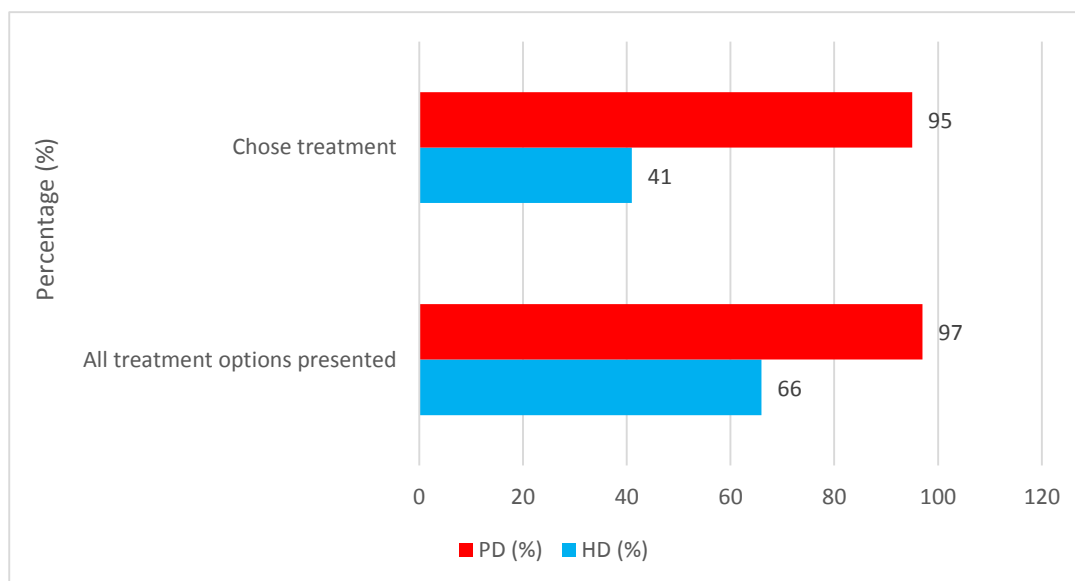


Figure 4.5 Percentage of patients who were presented with all treatment options and chose their treatment (n=200).

4.5 Renal replacement therapy

4.5.1 Dialysis

Thirty-six percent (36%) of the total dialysis sample was within their first year of dialysis; 29% were within their second year; 14% in their third year; 9% in their fourth year; 7% in their fifth year; and 6% were on dialysis for more than six years (Figure 4.6).

Close to a third or more of the patients in both groups were within their first year on dialysis i.e. both in-centre HD (37%) and at home PD (35%). The number of years on dialysis declined in both the PD and HD patients, with only 8% of HD patients and 3% of PD patients still remaining on dialysis after more than six years. There was no significant difference in modality survival or survival in general between the two patient groups (Figure 4.6).

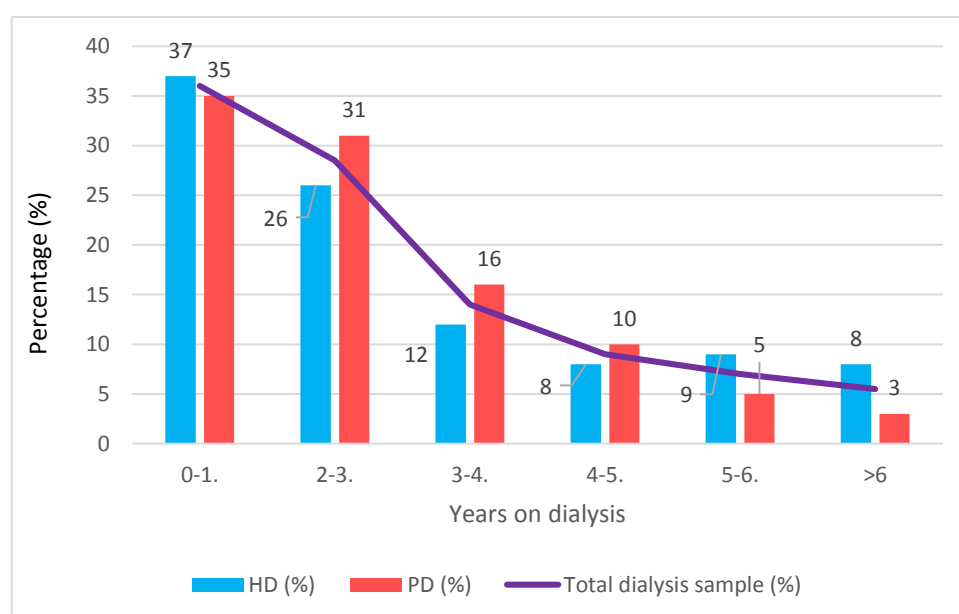


Figure 4.6 Years on dialysis (n=200).

When evaluating dialysis access, the majority of PD patients (65%) had only one access placement. In contrast, the majority of HD patients (29%) had more than five access placements ($p < 0.001$) (Figure 4.7).

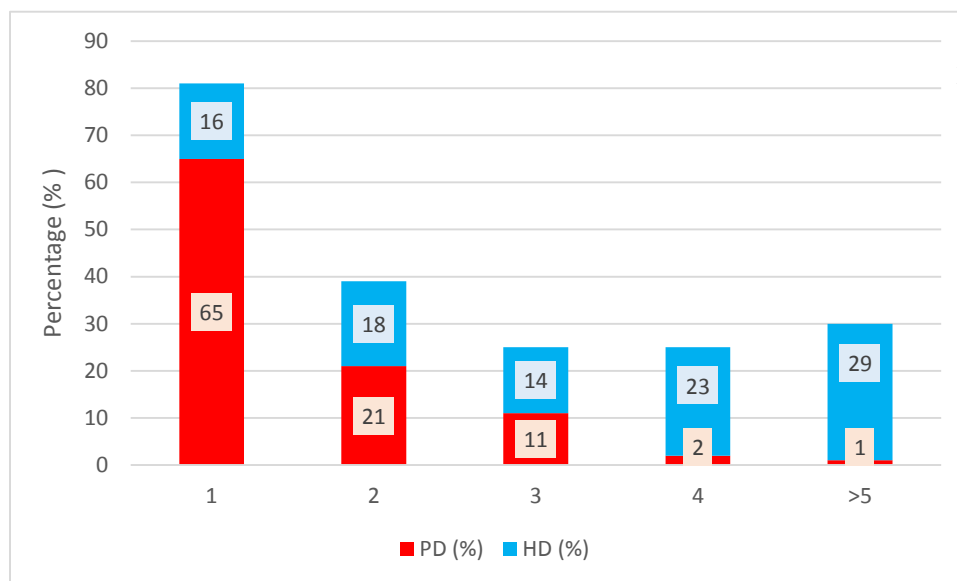


Figure 4.7 Total number of access placements (n=200).

4.5.2 Transplantation

A total of 34% of the total study population (n=200) were awaiting a transplant. The majority of patients were PD patients (41%), with only 26% of HD patients being suitable or having been prepared for renal transplantation (Figure 4.8).

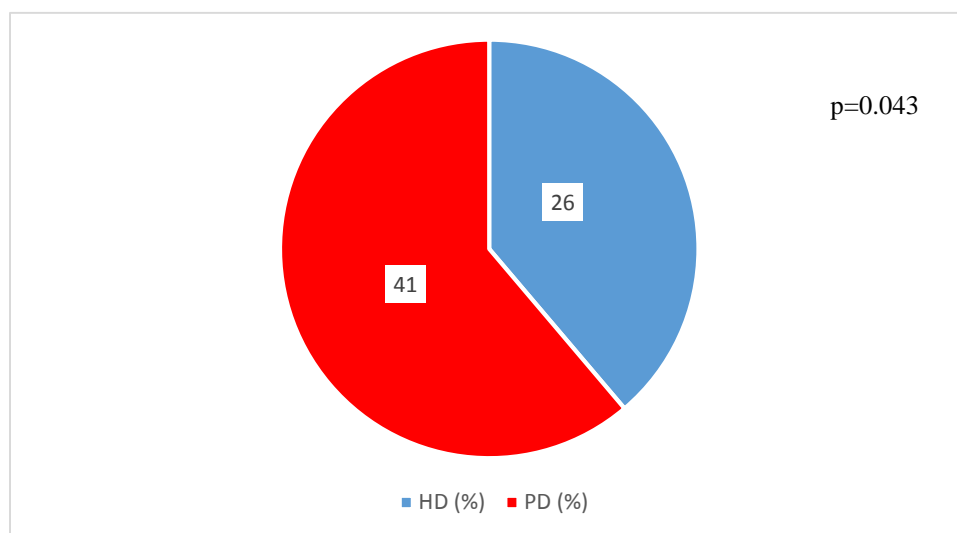


Figure 4.8 Percentage of dialysis patients awaiting transplant (n=188).

The mean age of patients on the transplant list in both the HD and PD group was younger than the patients not on the transplant list.

The mean age of the HD patients on the transplant list was 41 ± 12 years of age and for PD patients the mean age was 47 ± 12 years ($p > 0.05$) (Figure 4.9).

An additional 12 patients from the total sample ($n=200$) of the HD and PD patients were excluded from this analysis as they were not certain whether they were on the transplant list. Several patients had completed the transplant work-up but were unsure of their status on the transplant list, and were therefore excluded ($n=188$) from the data below (Figure 4.9).

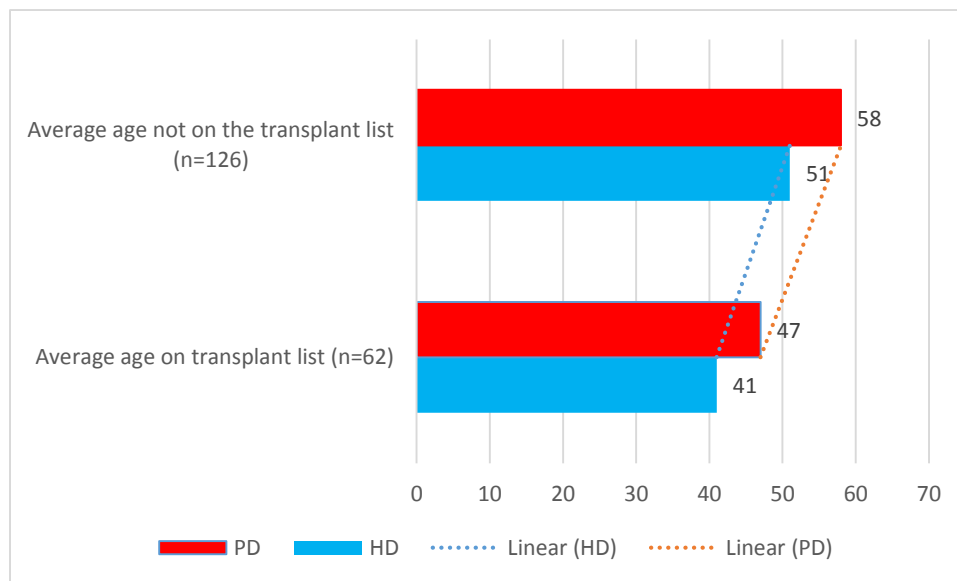


Figure 4.9 The average age of patients awaiting transplantation ($n=62$).

Of the 62 patients on the transplant list, 17% of PD patients and 12% of HD patients were diabetic, and 36% of PD patients and 8% of HD patients had cardiovascular disease (Figure 4.10).

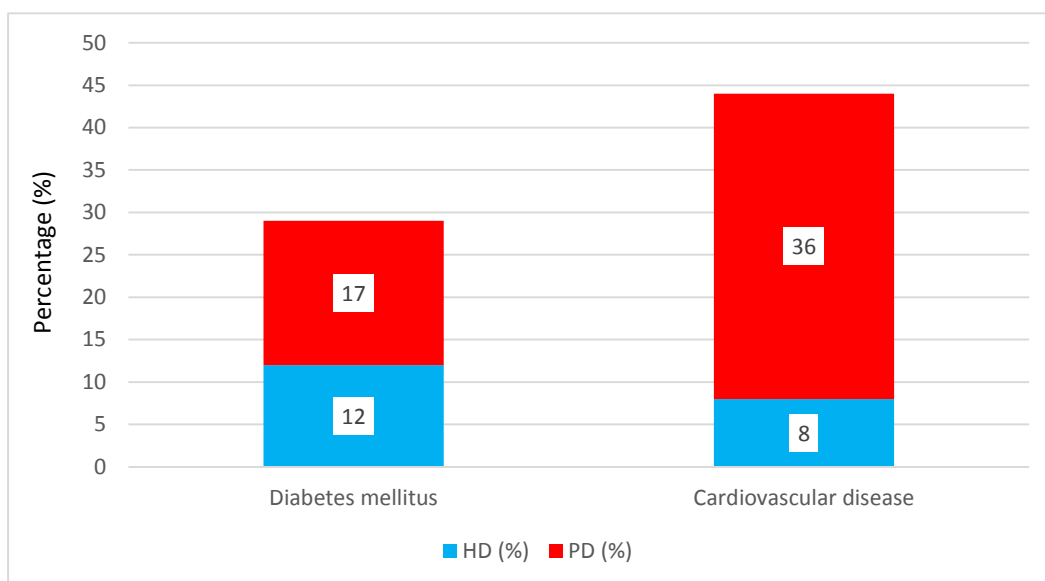


Figure 4.10 The prevalence of diabetes mellitus and cardiovascular disease in patients on the transplant list (n=62).

4.6 Clinical and biochemical analysis

No significant difference was found in the blood pressure (BP) range between the two dialysis groups. However, it was only a once-off blood pressure reading taken pre-dialysis. The majority of HD patients (34%) had a blood pressure between 121-140mmHg, compared to the PD patient group, where 29% of the PD patients had a blood pressure between 141-160mmHg (Figure 4.11). The average blood pressure for the total patient sample (Group A; n=200) was 141/82mmHg.

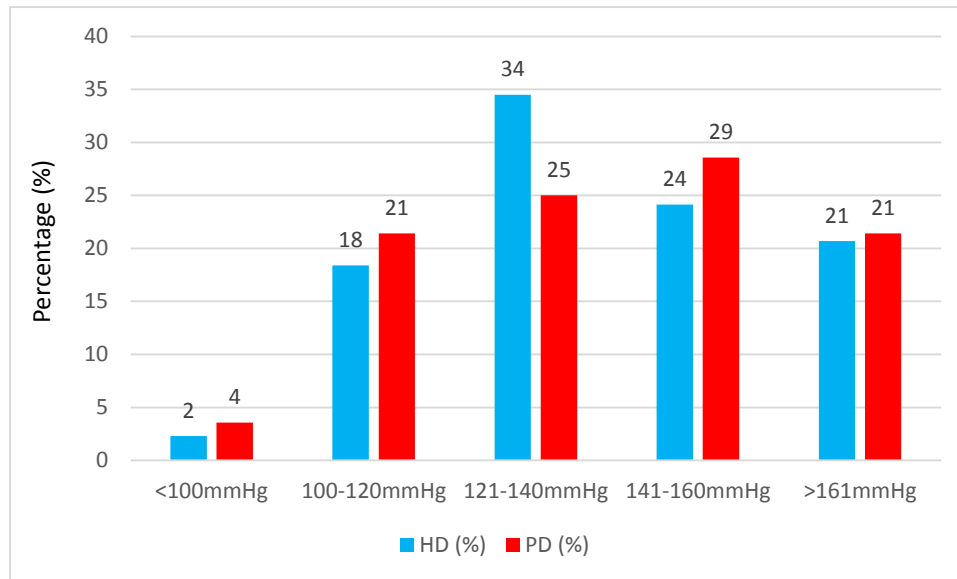


Figure 4.11 Systolic blood pressure for the total dialysis sample (n=200).

The average potassium (Table 4.4) taken pre-dialysis was significantly different ($p=0.000$) in the HD and PD patient groups. The HD group had a higher potassium level of $5.1\pm 0.87\text{mmol/L}$, compared to the PD group of $4.4\pm 0.97\text{mmol/L}$.

The HD group had a higher urea value ($24.03\pm 7.28\text{mmol/L}$), compared to the PD group (20.13 ± 7.68) ($p=0.001$). The PD group had a slightly higher creatinine level ($837.9\pm 363.49\text{mmol/L}$), compared to the HD group ($835.3\pm 329.22\text{mmol/L}$) ($p=0.96$) (Table 4.4).

A further significant difference was found in regards to calcium between the two groups. The HD group had lower calcium levels of 2.2 ± 0.25 , compared to the PD group ($2.46\pm 0.22\text{mmol/L}$). The parathyroid hormone (PTH) in the HD group was significantly lower at $353.83\pm 330.04\text{pg/mL}$, compared to the PD group of $498.65\pm 555.56\text{pg/mL}$ ($p=0.036$) (Table 4.4).

Table 4.4 Mean biochemical analysis (n=200).

Biochemical compounds	HD		PD		p-value
	Mean	Std	Mean	Std	
Sodium (mmol/L)	138	3.13	137	4.25	0.559
Potassium (mmol/L)	5.1	0.87	4.4	0.97	<0.0001
Urea (mmol/L)	24.03	7.28	20.13	7.68	0.001
Creatinine (mmol/L)	835.3	329.22	837.9	363.49	0.96
Phosphate (mmol/L)	1.8	0.67	1.7	0.51	0.17
Calcium (mmol/L)	2.2	0.25	2.46	0.22	0.000
Parathyroid hormone (pg/mL)	353.82	330.04	498.54	555.56	0.08
Albumin (g/L)	37.49	5.18	31.45	6.35	0.000
Ferritin (ng/mL)	417.34	479.37	323.19	424.59	0.191
TSAT (%)	27.49	16.33	23.56	10.51	0.131
Haemoglobin (g/dL)	11.27	1.94	11.89	1.96	0.036

The biochemical analysis was further categorised into targeted areas (Table 4.5), as defined by the National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKF KDOQI) and the Kidney Disease: Improving Global Outcomes.

Once again a significant difference ($p=0.002$) was seen in the HD group's potassium, with 40% of patient in the targeted range of 3.5-5mmol/L, compared to the PD group in which 64% of patients were within the targeted range (Table 4.5).

Fewer of the HD patients' phosphate (Table 4.5) was within the targeted range (1.13-1.8mmol/L) (36%), compared to the PD group (55%) ($p=0.012$).

Table 4.5 Biochemical analysis within targeted areas.

Biochemical compounds	Normal reference values	HD (%)	PD (%)	p-value
Potassium (mmol/L)	3.5-5	40	64	0.002
Calcium (mmol/L)	2.1-2.4	55	40	0.053
Calcium/Phosphate product	<4.4	62	65	0.364
Phosphate (mmol/L)	1.13-1.8	36	55	0.012
PTH (pg/mL)	<600	84	70	0.052
Ferritin (ng/ml)	200-799	44	40	0.355
TSAT (%)	20-49	56	65	0.231
Haemoglobin (g/dL)	10-12	42	32	0.111

4.7 Quality of life

4.7.1 Quality of life of the total dialysis sample

The overall quality of life (QOL) score divided into five domains and eight scales for the total sample of Group A (n=200), including both in-centre HD and at home PD patients, is represented in the table below. The five domains of QOL included the two summary scores: the physical composite score (PCS) and mental composite score (MCS), along with the overall symptom, effect and burden of CKD score. The eight scale scores derived from the PCS and MCS are physical functioning, role limitations (emotional and physical), pain, general health, emotional well-being, social function, and vitality (energy/fatigue) (Figure 2.11; Table 4.6).

For the overall two summary scores of QOL, the physical health composite score (PCS) was 40.49 ± 10.43 , and the mental health composite (MCS) score was 45.87 ± 9.64 (Table 4.6).

The mean score for the symptom category of QOL was 75.38 ± 17.32 , followed by the effect of kidney disease score of QOL of 63.38 ± 24.26 , and thereafter the burden of kidney disease QOL score of 50.59 ± 30.02 (Table 4.6).

Derived from the PCS (Figure 2.11): the physical functioning score was 53.23 ± 27.92 ; the role limitations (physical) score was 50.08 ± 37.98 ; bodily pain was 64.9 ± 28.08 ; and general health was 54.28 ± 22.29 (Table 4.6).

Derived from the MCS (Figure 2.11): the mental health, emotional well-being score was 67.53 ± 20.21 ; the role limitations (emotional) was 54 ± 41.44 ; the social function was 50; followed by the vitality (energy/fatigue) score of 35.55 ± 14.59 (Table 4.6).

Table 4.6 Quality of life of chronic dialysis patients (n=200).

Quality of life score	Number of items in scale	Mean	Std
SF-12 Physical Health Composite	12	40.49	10.43
SF-12 Mental Health Composite	12	45.87	9.64
Physical functioning	10	53.23	27.92
Role limitations - physical	4	50.08	37.98
Pain	2	64.90	28.08
General health	5	54.28	22.29
Emotional well-being	5	67.53	20.21
Role limitations - emotional	3	54.00	41.44
Social function	2	50.00	0.00
Energy/fatigue	4	35.55	14.59
Symptom/problem list	12	75.38	17.32
Effects of kidney disease	8	63.38	24.26
Burden of kidney disease	4	50.59	30.02

Out of the 36 questions of the Medical Outcome Study 36-item Short-Form Health Survey (SF-36), 18 questions were significantly different between the HD and the PD patient groups (Table 4.7).

A further two questions (11a and b) were marginally significant (Table 4.7).

Table 4.7 The quality of life of haemodialysis patients compared to peritoneal dialysis patients.

Number	Question	p-value
3a	Completion of strenuous activities	
3b	Completion of moderate activities	0.002
3c	Completion of mild activities	0.047
3d	Climbing several flights of stairs	0.001
4d	Accomplished less because of emotional problems	0.047
8a	Amount of time spent with family and friends	0.050
9c	Felt calm and peaceful	0.009
9f	Felt happy	0.001
10d	Kidney disease interferes too much	<0.0001
10f	Feel frustrated dealing with kidney disease	0.016
10g	Feel like a burden on my family	0.039
11i	Feel washed out or drained	0.001
12a	Affected by fluid restriction	<0.0001
12b	Affected by dietary restriction	0.003
12c	Ability to work around the house	<0.0001
12d	Ability to travel	<0.0001
12e	Being dependent on doctors and medical staff	<0.0001
13	Average sleeping pattern	0.020
11a	Muscle pain	0.078
11d	Itchy skin	0.080

4.7.2 Unadjusted quality of life scores

The unadjusted quality of life score divided into five domains with eight scales of PCS and MCS is reported below (Table 4.8).

Within the five domains of QOL, PD patients had an improved QOL in terms of symptom management (77.60; $p=0.067$), effect of kidney disease (71.56; $p=0.00$); and burden of kidney disease (53.81; $p=0.148$) (Table 4.8).

Haemodialysis patients reported an improved QOL in terms of the PCS (41.33; $p=0.252$), although not significant. The PD patient group reported an improved MCS (46.72; $p=0.168$) when compared to HD group, although again not significant (Table 4.8).

Within the eight domains of the PCS and MCS, vitality (energy/fatigue) was the only significant variable and was found to be greater in the HD patients (38.10 ± 14.75), compared to the PD

patients (33 ± 14.03) ($p=0.04$). Role limitation was found to be marginally significant ($p=0.09$), with PD patients experiencing a reduced effect of role limitations as expressed in the greater score (59 ± 41.06) (Table 4.8).

Table 4.8 Overall unadjusted quality of life score.

Quality of life score	Number of items in scale	HD (n=100)		PD (n=100)		p-values
		Mean	Std	Mean	Std	
SF-12 Physical Health Composite	12	41.329	10.256	39.637	10.566	0.252
SF-12 Mental Health Composite	12	44.841	10.194	46.724	9.006	0.168
Physical functioning	10	52.10	32.26	54.35	22.87	0.2
Role limitations - physical	4	50.42	40.38	49.75	35.62	0.6
pain	2	64.63	32.04	65.18	23.63	0.6
General health	5	55.48	26.04	53.21	18.11	0.7
Emotional well-being	5	67.28	23.89	67.78	15.81	0.9
Role limitations- emotional	3	49.00	41.43	59.00	41.06	0.09
Social function	2	50.00	0.00	50.00	0.00	—
Energy/fatigue	4	38.10	14.75	33.00	14.03	0.04
Symptom/problem list	12	73.125	16.913	77.604	17.482	0.067
Effects of kidney disease	8	55.188	22.926	71.564	22.854	0
Burden of kidney disease	4	47.625	30.135	53.813	30.045	0.148

Following a univariate analysis consisting of the T-test, Mann-Whitney, Chi-square and Fishers exact, significant values ($p\leq 0.05$) and marginal significant values ($p\leq 0.1$) were taken further into a multivariate regression with the use of ANCOVA.

4.7.3 Adjusted quality of life scores

The multiple regression technique was used with the adjusting of the covariate to differentiate between the groups.

Figure 4.12 represents the symptom score of QOL adjusted for age ($p=0.06$). Peritoneal dialysis patients had an improved symptom control score of 77.94, compared to the HD patients of 72.79 ($p=0.04$) (Figure 4.12).

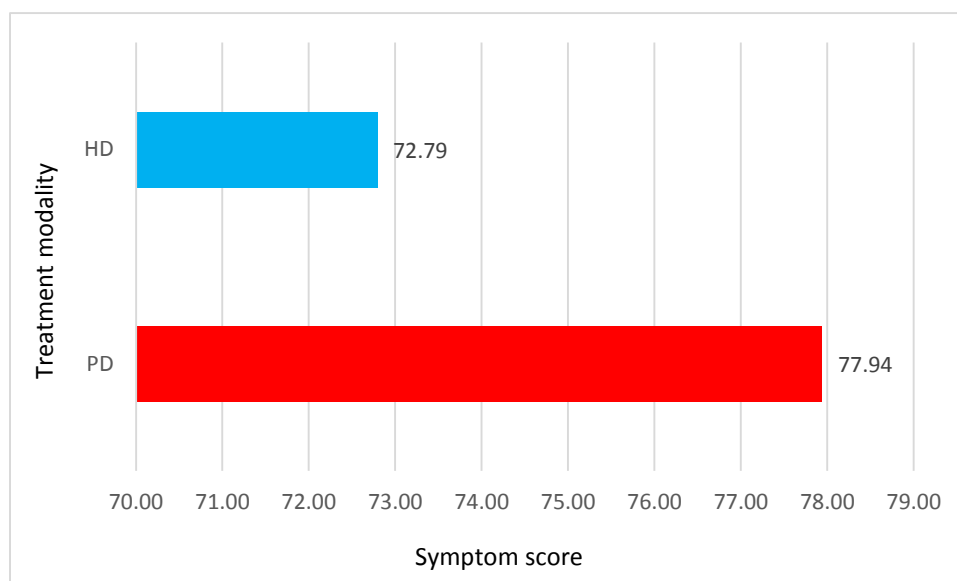


Figure 4.12 Symptom score of quality of life, adjusted for age (n=200).

The effect of kidney disease score adjusted for albumin ($p=0.06$) is shown in the figure below (Figure 4.13). The adjusted effect score of QOL shows the PD patients have an improved effect of kidney disease score (74.91), when compared to the HD patients (54.17) ($p=0.000$).

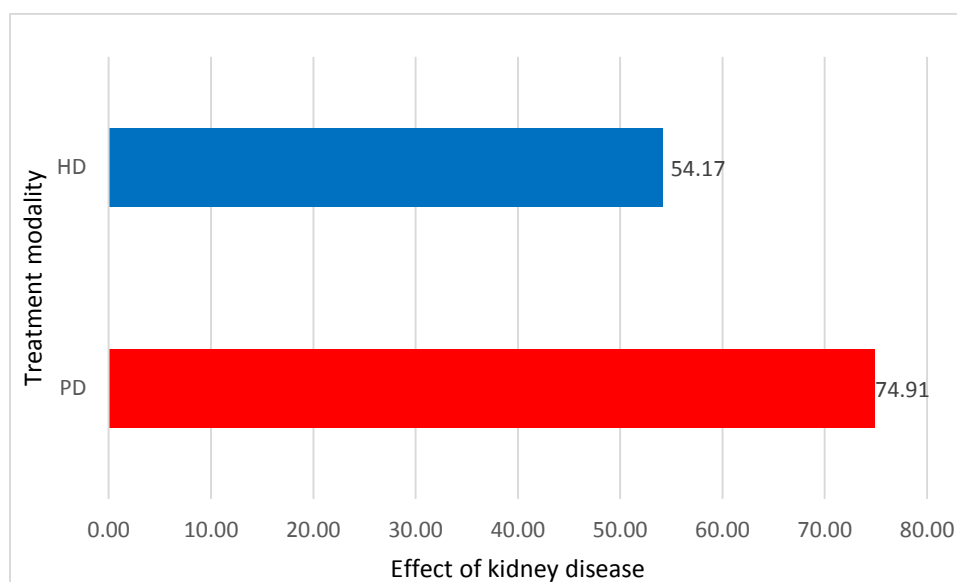


Figure 4.13 The effect of kidney disease score adjusted for albumin (n=200).

The figure below (Figure 4.14) represents the burden of kidney disease score adjusted for urea ($p=0.06$), creatinine ($p=0.04$) and albumin ($p=0.08$). Peritoneal dialysis patients had an improved burden quality of life score (56.93), compared to HD patients (46.14) ($p=0.019$).

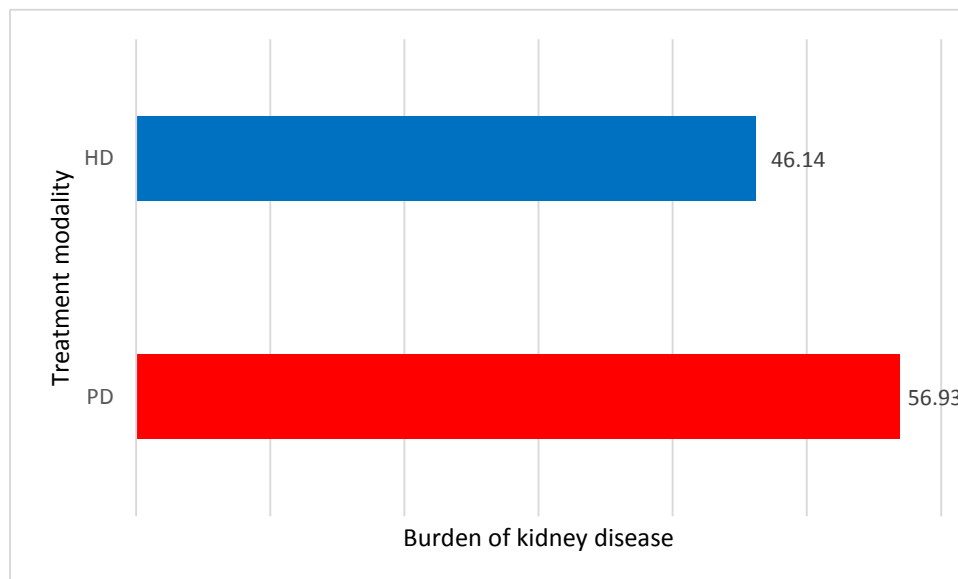


Figure 4.14 The burden of kidney disease score adjusted for urea, creatinine and albumin ($n=200$).

The physical health composite score (PCS) of the quality of life adjusted for age ($p=0.05$), urea ($p=0.02$), creatinine ($p=0.02$), and albumin ($p=0.03$) is represented below (Figure 4.15). Haemodialysis patients had an improved PCS (41.56), compared to PD patients (40.86) ($p<0.001$).

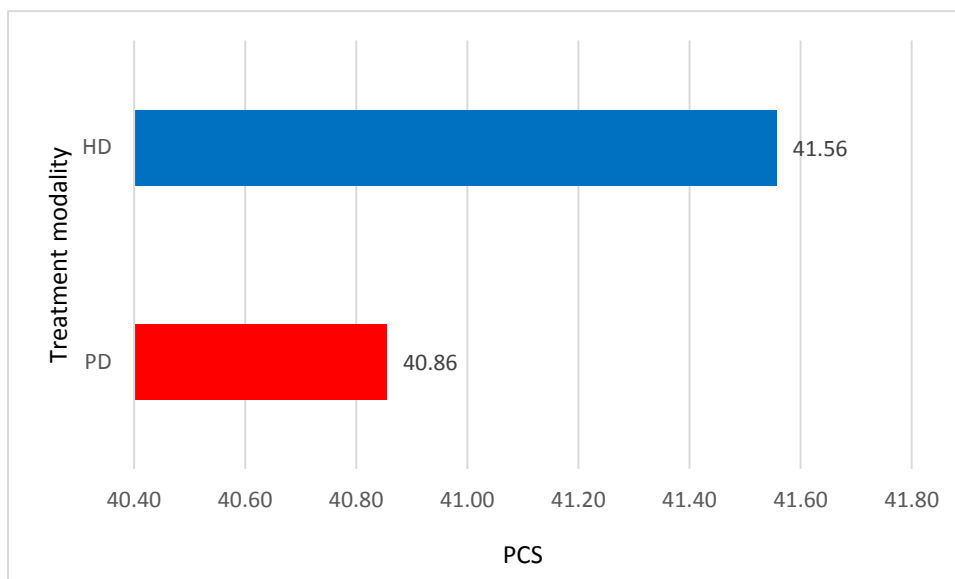


Figure 4.15 The physical composite score adjusted for age, urea, creatinine and albumin (n=200).

The mental composite score (MCS) when adjusted for albumin ($p=0.163$) became marginally significant ($p=0.55$) between the two modalities, HD and PD. However, albumin was a confounder, as there was a $>15\%$ difference in the co-efficient; therefore, even when corrected there was no significant difference in the adjusted MCS in both HD and PD patients (Figure 4.16).

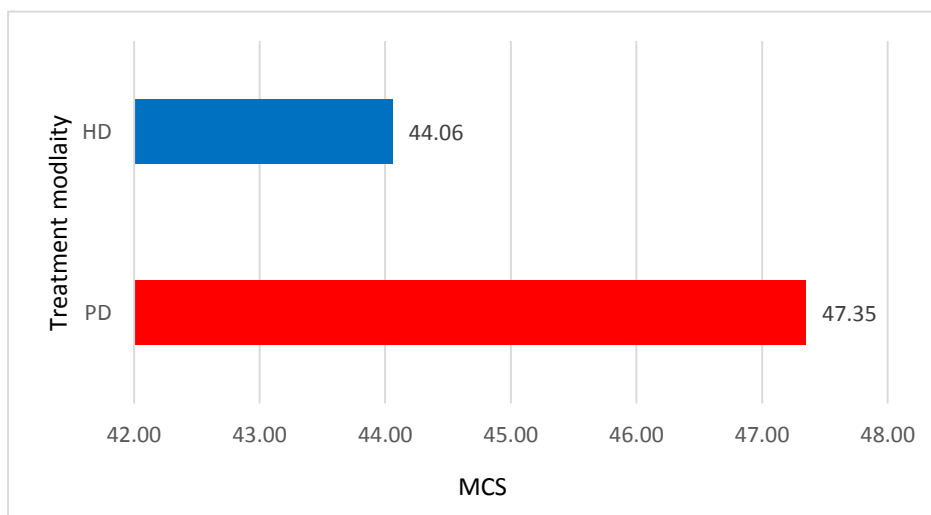


Figure 4.16 The adjusted mental composite score (n=200).

Regression analysis was used for the eight scales of physical health and mental health. Table 4.9 represents the significant and marginally significant variables ($p<0.1$). Age was associated with physical functioning ($p=0.006$); being managed prior to ESKD

($p=0.065$) and PESKD management ($p=0.032$) was associated with general health; years on dialysis was associated with emotional well-being; diabetes associated with role emotional (0.04) and role physical (0.059); and lastly, being on the transplant list was associated with mental health.

Table 4.9 Regression analysis of factors associated with SF-36 ($p < 0.1$) (Group A; $n=200$).

	Regression analysis (p -values < 0.1)						
	Physical functioning	Role physical	General health	PCS	Emotional well-being	Role emotional	MCS
Age	0.006			0.036			
Years on dialysis					0.028		
Diabetes		0.059				0.04	
Transplant list							0.003
Managed prior to ESKD			0.065				
PESKD management			0.032				

Although emotional well-being was associated with years on dialysis ($p=0.028$) (Table 4.9) for the group ($n=200$), there was no significant difference found in HD ($n=100$) or in PD for PCS and MCS ($n=100$) (Figure 4.17 and Figure 4.18).

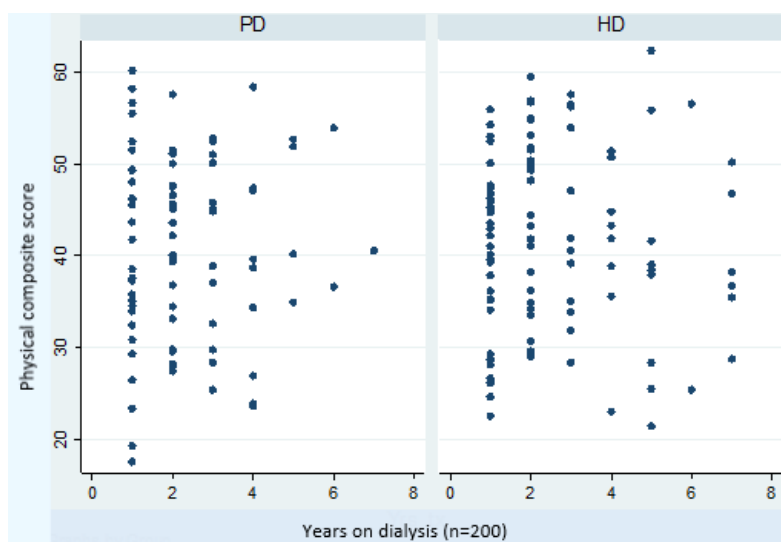


Figure 4.17 Graphical representation of the physical composite score in relation to the number of years on dialysis ($n=200$).

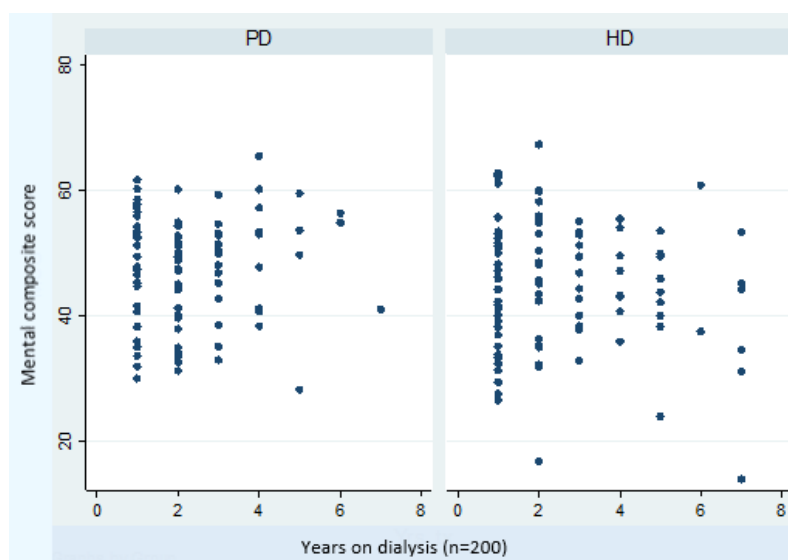


Figure 4.18 Graphical representation of the mental composite score in relation to the number of years on dialysis (n=200).

4.7.4 Quality of life and patient education

A significant difference in the knowledge of factors related to CKD is seen in in-centre HD and at home PD patients (Table 4.10). The majority of PD patients understood anaemia (95.65%) compared to the HD patients understanding of anaemia (60%) ($p=0.001$). Haemodialysis patients had greater knowledge on diet ($p=0.04$), bone disease ($p=0.003$), and complications of CKD ($p=0.006$) (Table 4.10).

Table 4.10 Patient knowledge amongst haemodialysis and peritoneal dialysis patients.

Patient educated on the following:	HD (%) (n=100)	PD (%) (n=100)	p-value
Fluid	86	100	0.07
Anaemia	60	95.65	0.001
Cardiovascular disease	86.96	72	0.189
Diet	100	84	0.04
Bone disease	78.26	43	0.003
Access	100	86	0.07
Dialysis adequacy	91.3	75	0.1
Medication	100	91	0.2
Complications of CKD	91.3	62	0.006

The PCS of the QOL was found to be related to the understanding of managing the complications associated with CKD ($p=0.01$) and access management (0.01). The understanding of diet was found to be significant to the burden of CKD ($p=0.01$) and the complications associated with CKD was found to be further significant to the effect ($p=0.01$) and symptom domain of the quality of life.

Patients who participated in a PESKD management programme had an improved knowledge on fluid management, anaemia management, cardiovascular disease, bone disease, access management, medication, and complications of CKD when compared to patients who were managed by a nephrologist/physician prior to commencing dialysis ($p>0.05$) (Table 4.11).

Table 4.11 Patient knowledge amongst patients who were aware of their kidney disease, whose kidney disease was managed, and those who were managed by a PESKD management programme ($n=200$).

	Aware of their kidney disease (%)	Kidney disease managed (%)	PESKD management programme (%)
Fluid	86	93	100
Anaemia	72	66	67
Cardiovascular disease	72	72	81
Diet	93	90	90
Bone disease	47	45	57
Access	88	90	100
Dialysis adequacy	77	83	76
Medication	98	97	100
Complications of CKD	74	79	86

4.7.5 Quality of life in relation to the differences in pre-end stage kidney disease management

Three groups from the total sample population ($n=200$) were evaluated in relation to QOL. The first group included patients who were informed and were aware of their kidney disease prior to commencing dialysis; the second group included patients being managed prior to commencing dialysis by a nephrologist or physician; and the third group included patients who participated in a PESKD management programme and were early referral patients, and patients managed for more than three months prior to starting

dialysis. Being managed prior to dialysis has shown to influence the effect of kidney disease in relation to quality of life (Figure 4.19). In Figure 4.19, in the patients who were managed prior to dialysis, the effect of kidney disease (74.61) is improved, compared to those patients who were not managed (63.91) ($p=0.01$). There was, however, an interaction represented by the trend line between the modality (HD and PD) and PESKD.

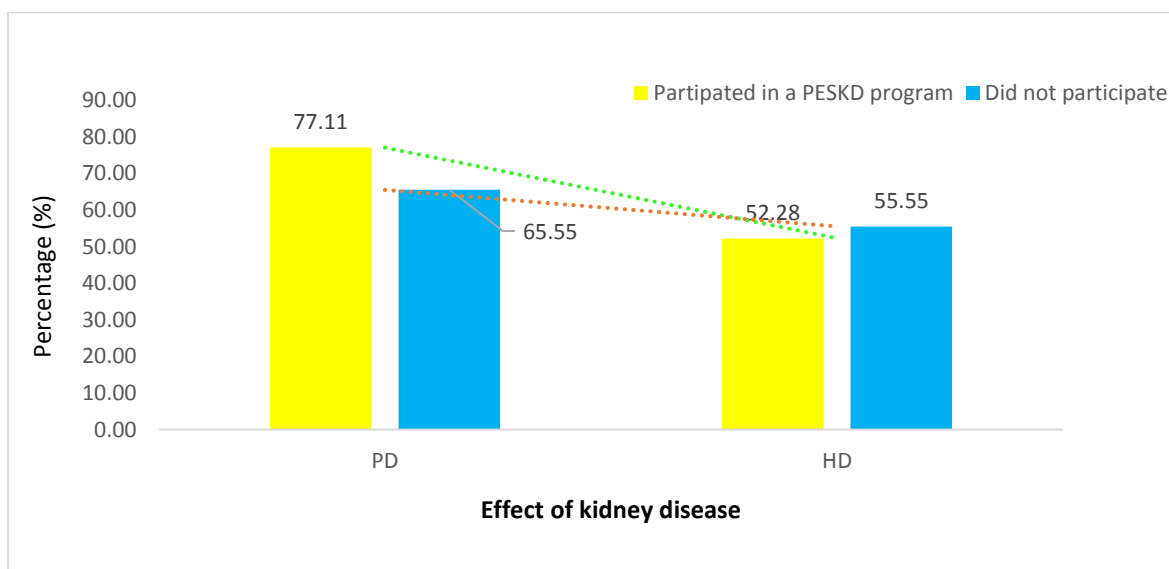


Figure 4.19 Being managed prior to dialysis in relation to the effect of kidney disease (n=200).

Participation in a PESKD management programme has shown to reduce the burden of kidney disease (51.64 to 50.67; $p=0.02$) once dialysis has commenced (Figure 4.20).

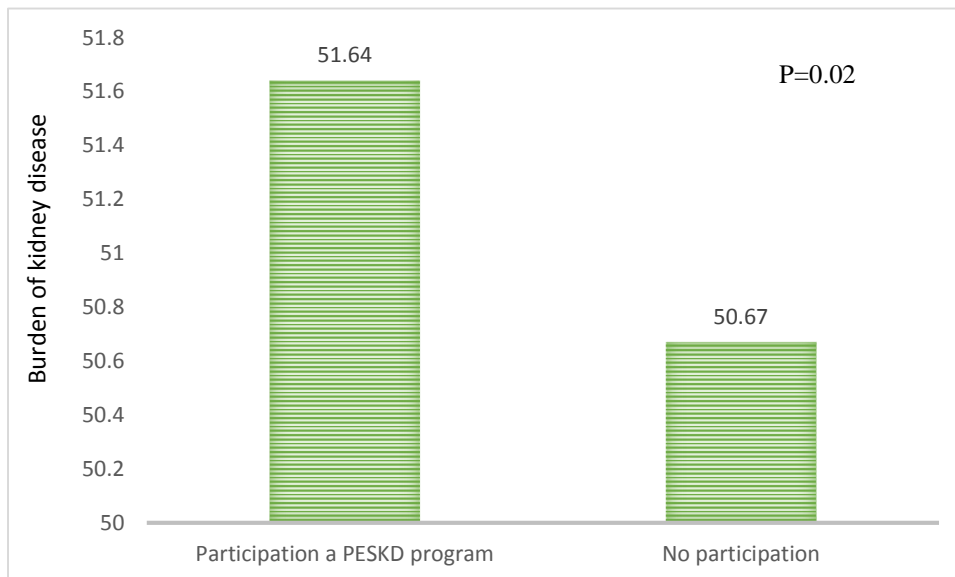


Figure 4.20 Pre-end stage kidney disease management programme in relation to the burden of kidney disease (n=200).

4.8 Nephrology professionals' perspective on quality of life

Nephrology professionals' and dialysis patients' perspective on whether enough public awareness is created around kidney disease is represented in Figure 4.21. The majority of PD patients (75%) feel enough awareness is being created and sufficient people are informed about kidney disease, compared to the minority of HD patients (25%) and nephrology professionals (36%) (Figure 4.21).

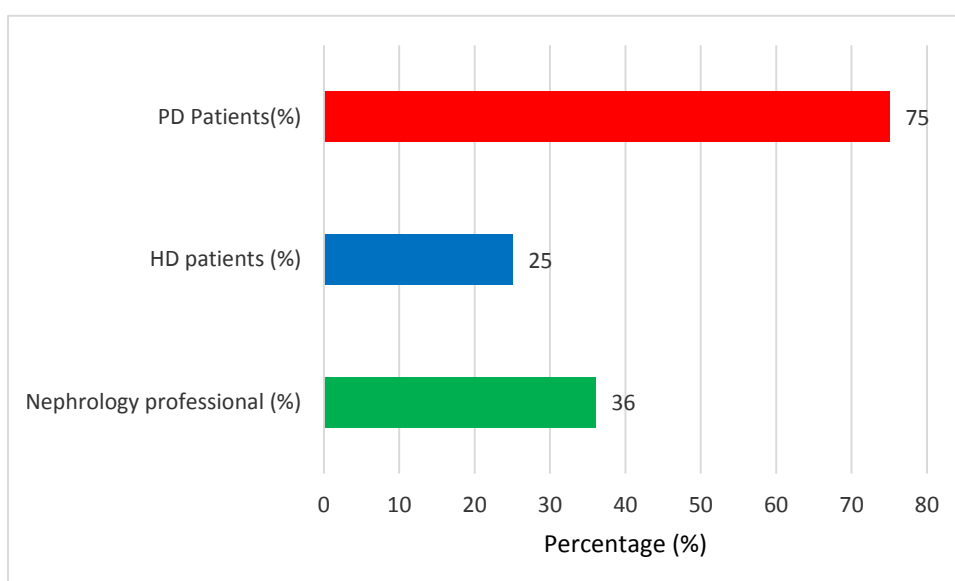


Figure 4.21 Awareness around CKD (n=300).

As shown below (Figure 4.22) the majority of nephrology professionals (95%) feel QOL is an important factor to consider in the management of patients with CKD. Only 71% feel the majority of healthcare professionals take it into consideration when treating kidney failure patients. A further 61% of healthcare professionals feel sufficient support for dialysis is provided to patients by healthcare professionals to enable patients to cope with their kidney disease and dialysis (Figure 4.22).

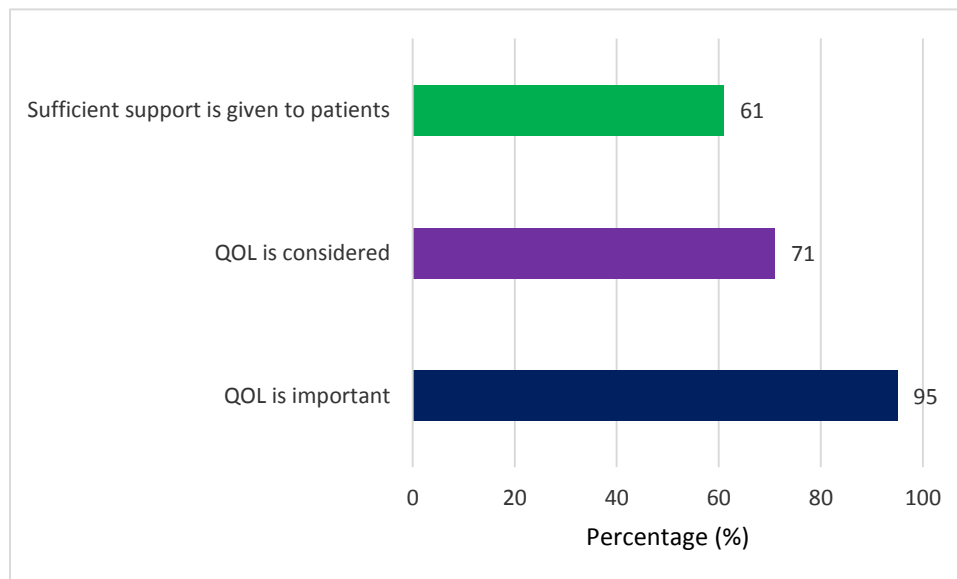


Figure 4.22 Nephrology professionals' perspective on quality of life and support given to patients (n=100).

The majority of nephrology professionals (80%) feel a non-dialysis pathway should be discussed with appropriate patients (including elderly patients and patients with advanced HIV); however, only 38% discussed a non-dialysis pathway with their patients who may have benefited from this pathway (Figure 4.23).

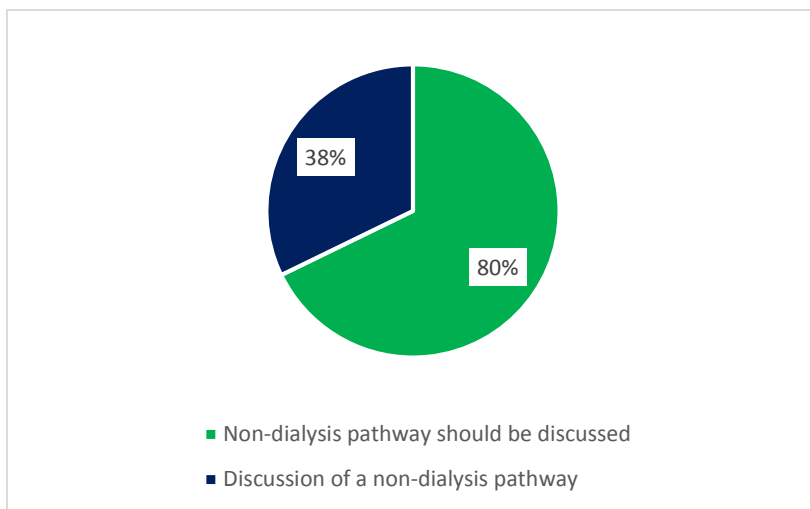


Figure 4.23 Non-dialysis pathway (n=100).

The majority of in-centre HD patients (n=100) rated their overall health as fair, whereas the majority of at home PD patients (n=100) rated their overall health as good. The nephrology professionals (n=100) rated their perspective of the overall health of dialysis patients, both HD and PD, to be fair - similar to the HD patients (Figure 4.24).

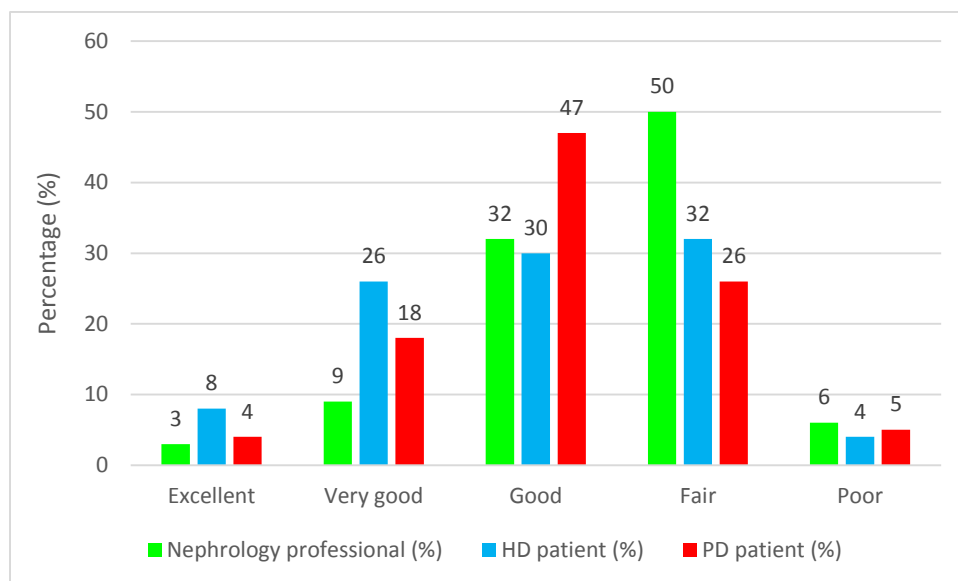


Figure 4.24 Overall rating of health: dialysis patient and nephrology professionals' perspective (n=300).

On a scale of 1 to 10, with 10 being the most difficult, nephrology professionals rated living with kidney disease an overall 7.49 (Figure 4.25).

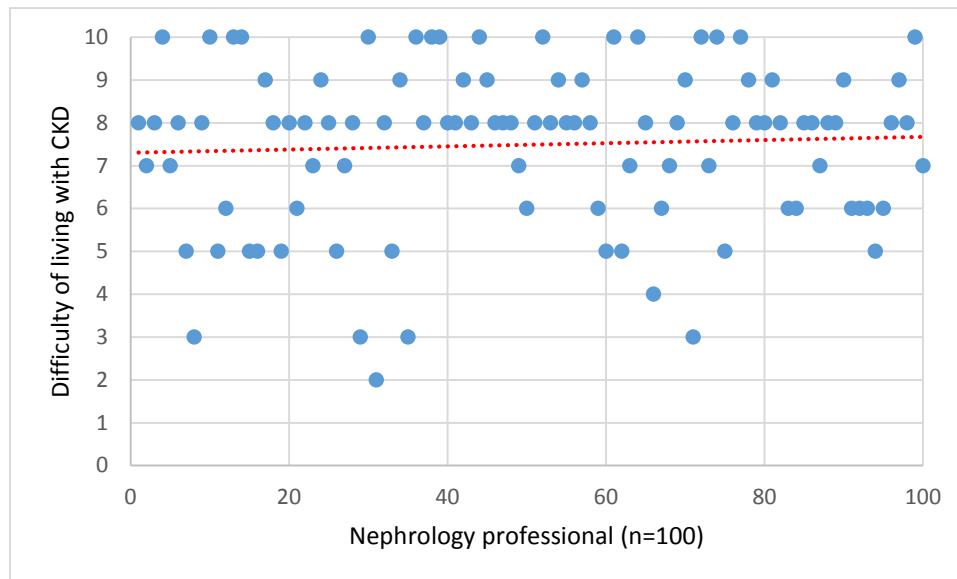


Figure 4.25 Difficulty living with kidney disease: nephrology professionals' perspective (n=100).

This study aimed to determine what healthcare professionals believe dialysis patients understood regarding their disease and treatment, compared to what patients actually understood. The knowledge of dialysis patients (Group A; n= 200) compared to the nephrology professionals' (n=100) perspective is shown in the figure below (Figure 4.26). A significant difference was found regarding the understanding of prescribed medication ($p = 0.002$); dialysis adequacy ($p = 0.03$); and cardiovascular disease ($p = 0.001$) - all of which the patients had a greater understanding than perceived (Figure 4.26).

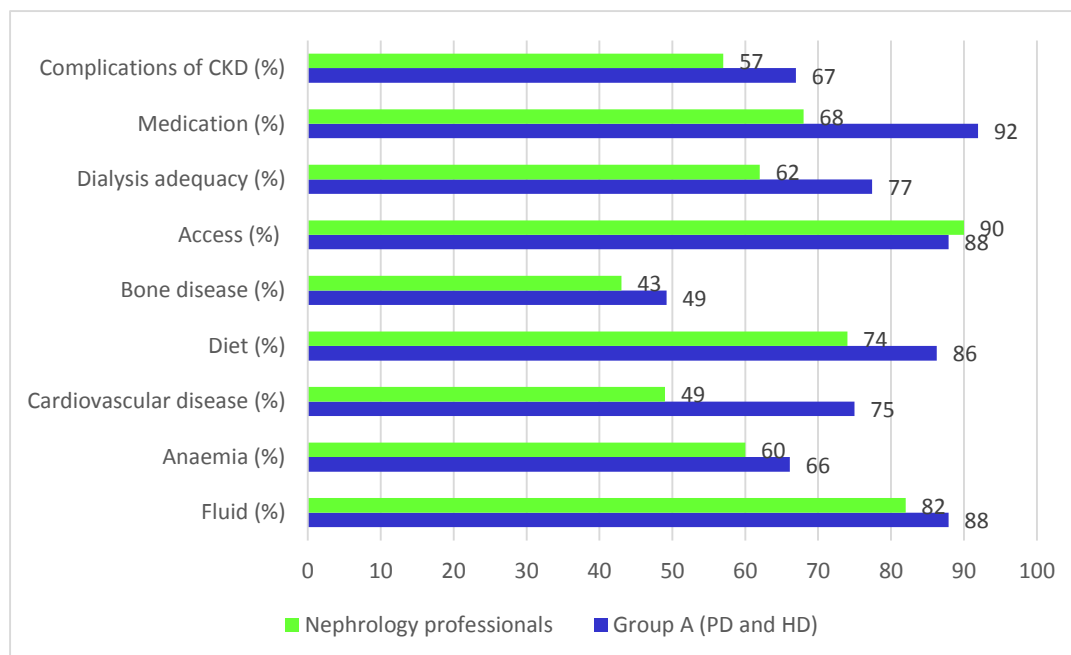


Figure 4.26 Dialysis patients' knowledge compared to nephrology professionals' perspective (n=300).

Chapter 5 Discussion

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Chapter 5 Discussion

5.1 Introduction

As chronic kidney disease (CKD) is a worldwide public health problem and there is a rising incidence of patients requiring renal replacement therapy (RRT), with increasing healthcare costs and poor clinical outcomes (White *et al.*, 2008; Naicker, 2010; Okpechi *et al.*, 2012; Okpechi *et al.*, 2013), it is becoming increasingly important to ensure that where it can be offered patients' quality of life (QOL) is considered and prioritised. Quality of life is recognised to be important by the majority of nephrology professionals, although it remains an overlooked aspect of the disease experience, as it is not always taken into account when treating patients with kidney disease (Figure 4.22). Previously QOL was not routinely included into the evaluation of dialysis adequacy; however, recent research has highlighted the association of QOL to morbidity, mortality and clinical outcomes. Quality of life has been reported to be an equally important marker in the evaluation of treatment outcome; it is especially important when dialysis services are rationed to ensure the patient is obtaining the best value for spending on what is an expensive and limited therapy. The Centre for Medicare in the United States has acknowledged the importance of QOL and it has mandated the use of QOL surveys in clinical practice.

5.2 Patient demographics

The dialysis population within this study was much younger than that reported in other developed countries (Figure 4.1) (Ng and Anpalahan, 2011); although the patients in the current study were older than patients seen in the public health sector (Okpechi *et al.*, 2013). It is probable that the younger dialysis population seen in the public health sector in South Africa is a consequence of the exclusion criteria associated to RRT in this sector (Table 2.1). Kidney disease patients between the ages of 50 and 60 years may receive RRT, depending on available space in the programme and their suitability for transplantation. However, patients over 60 years are in general excluded from dialysis in government hospitals. The age of our cohort reflects the fact that in the private healthcare sector age is not an exclusion criteria to dialysis. In fact, in this study, nearly one-third of patients were older than 60 years (Figure 4.1). Had these patients been dependent on the public health sector

for RRT, they would have been turned down and not offered RRT; ultimately been left to die (Okpechi *et al.*, 2012).

This study was carried out predominantly in the private sector, with a 100% of PD patients and 90% of HD patients in the private sector, which traditionally supports only 20% of the population. There remains a disproportionate ratio of white individuals with access to private healthcare, when compared to other population groups, and this is well described in the literature review (2.3) and reflected in this study population (Bell, 1998; Government Gazette, 2011; van den Heever, 2012). Both haemodialysis (HD) and peritoneal dialysis (PD) had predominantly white patients (Table 4.1). Although the total study population does not reflect the South African population, or the challenges of the public health sector, it does represent those that have access to private healthcare.

The patient profile in the study reflects the demographic make-up of medical schemes which has drastically changed over the last few years. Traditionally disadvantaged people are now gaining access to private care. Eight years ago there was a significant uptake of medical insurance by a surging black middle class market. The result was an increase in the number of black members and by 2010 black beneficiaries constituted more than half of all beneficiaries at 46.3%, with white individuals now well below 35.7% (van den Heever, 2012).

In South Africa the unemployment rate is 25%, which is slightly higher than seen in the PD patient group (Table 4.1). This is high as this patient group is wealthier than the general population, as they can afford private dialysis. An even higher unemployment rate was reported in the HD group (Table 4.1). Similar high unemployment rates have been demonstrated in the public dialysis units in South Africa, which reflects the overall real issue, which is that it is difficult to work if you are on dialysis. The high unemployment rate is likely a result of patients losing their employment shortly after commencing dialysis. This is due to the associated demands of dialysis in terms of travelling to and from HD, and if on PD, the time needed to complete the exchanges (Okpechi *et al.*, 2013). It is often more difficult for patients on HD as the dialysis is three times a week for four hours or more; this makes it particularly difficult. This appears to be the case in this study.

The aetiology of CKD in the study was similar to previous reported studies (Figure 4.3) (Naicker, 2010; Crockell, 2012; Lowth, 2013). Hypertension was the leading cause of CKD in the total dialysis population, followed by diabetes, and thereafter polycystic kidney disease (Figure 4.3). The prevalence of diabetic nephropathy (Figure 4.3) was higher in this study than in previous research papers from Sub-Saharan Africa (SSA) where the estimated

prevalence was in the range of 6 to 16% (Naicker, 2010). Okpechi *et al.* (2013) reported that the prevalence of diabetes was 7.6% in a study at Groote Schuur Public Hospital. The prevalence of diabetes in the public sector is dependent on the available slots, and only if a diabetic patient is transplantable will a space be made available and will a diabetic patient be considered for dialysis. Diabetic patients would then need to be below 60 years, but usually are younger to qualify to ensure they are without significant vascular disease. In the private sector, the strict criteria of a patient needing to be transplantable is not required; therefore, more patients with diabetes are likely to be found in private dialysis units (Table 2.1). This is more reflective of developed countries.

The prevalence of glomerulonephritis was lower in the study compared to previous research published on SSA (Okpechi *et al.*, 2013). This probably reflects the way people are classified in the public sector. The diagnosis of a person having a glomerulonephritis is not necessarily made on renal biopsy, but is often presumptive. In this study it was predominantly made if biopsy confirmed the diagnosis or there was a clear history.

Several patients' cause of CKD was unknown in this study, which is a common finding. This also, like the diagnosis of glomerulonephritis, reflects that a biopsy is seldom done. This problem is particular to developing countries where the aetiology of CKD is rarely identified as a result of lack of early referral and kidneys are too small and shrunken to do a renal biopsy (Okpechi *et al.*, 2012).

An interesting finding in the study was seen in PD patients. These patients were found to be significantly older and had a higher prevalence of cardiovascular disease. Generally PD patients have been reported to be younger and had chosen PD to maintain active lifestyles. Although research has also reported that the preference of PD occurs especially among elderly patients with diminished cardiac reserve, so as to avoid accrual of fixed ischemic defects in the myocardium (Bargman, 2012; Chang *et al.*, 2013). The latter is more common in developed countries; this may reflect that the population in this study is more similar to a developed country cohort in this instance.

5.3 Quality of life

Recognising the importance of QOL for dialysis patients in general, and in particular for the medical groups paying for private dialysis, is important. This is because it is a measure of the treatment effectiveness. Despite the major advances in RRT, dialysis only partially corrects the symptoms associated with CKD. Overall CKD is still associated with a significant decline in QOL, which is further

emphasized in this study (Lausevic *et al.*, 2007; Berthoux and Bartiromo, 2008; Kimmel *et al.*, 2008).

The overall QOL score was expressed by the two summary scores, the physical composite score (PCS) and the mental composite score (MCS). The PCS is divided into four categories: physical functioning; role limitations-physical; pain; and general health. The MCS is divided into emotional well-being; role-limitations-emotional; social function; and energy/fatigue. In addition to the two summary scores are the symptom, effect, and burden of kidney disease score (Figure 2.11).

The MCS reflects the patient's ability to adapt psychologically to life situations. From the MCS in this study, the lowest reported score was the vitality (energy/fatigue) score (Table 4.6), which is expected as reduced energy levels are frequently cited by CKD patients, and a reduction in energy may be further compounded by the presence of renal anaemia. This was seen in the study as the majority of dialysis patients had a haemoglobin level outside the targeted range (Table 4.5). Probable associated explanations could include inadequate dosing of erythropoiesis stimulating agents (ESA) and the non-adherence with use of their ESA due to its expense, hence the financial burden. A reduced vitality score has further been shown to be related to reduced social interaction (Álvares *et al.*, 2012) which occurs when on dialysis. The highest score reported for this cohort was the emotional well-being (mental health) score, which is interesting considering the high reported prevalence of depression in dialysis patients (Kalender *et al.*, 2007); although, close to a third of the patients were in their first year of dialysis (Figure 4.6) and decreased mental health is predominantly seen with increasing years on dialysis.

The variables which have been reported to be associated with MCS include the presence of co-morbidities, advancing age and duration of treatment, hospitalisation and economic class (Álvares *et al.*, 2012). Similarly this study found an association between the scales of the MCS and existing co-morbidities, and in particular to diabetes and the duration of dialysis treatment. The role emotional scale of MCS revealed that diabetic patients have a reduced emotional scale. The emotional scale reflects a dialysis patient accomplishing less because of existing emotional problems; it includes not completing work as carefully and reducing the amount of time spent on activities. Having both diabetes and CKD pose an even greater challenge, as both are chronic debilitating conditions, affecting every aspect of a person's life (Sparring *et al.*, 2013). Patients with diabetic kidney disease are required to make greater changes to their lifestyle as they have greater dietary restrictions imposed by the two conditions and additional pharmacotherapy, which affects their ability to function normally. The stress and anxiety of the two

conditions takes its toll on patients and affects patient's psychological well-being (Shim *et al.*, 2012).

The lowest reported PCS was pain, showing patients are least affected by pain. The highest reported score was role limitations (physical) which are the extent to which physical health interferes with work - including accomplishing less and includes difficulties in performing activities. This is expected as dialysis is a time - consuming therapy. It involves at least 12 hours a week, excluding travel to and from treatment for HD, or for PD, daily exchanges of fluid. It is therefore not surprising that dialysis intruded in the patients' lives; this is reflected in their high unemployment rate (Table 4.1).

The PCS has been shown to be associated with treatment modality, sex, age, hospitalisation, extra consultation, co-morbidity index, economic class, employment status and marital status (Álvares *et al.*, 2012). Similarly, the study found an association of PCS to age, co-morbidity - particularly diabetes and PESKD management (Table 4.9). Younger patients had an improved PCS score and physical functioning score in the study (Table 4.9). Research has shown that the PCS tends to decrease steadily from younger to older patients (Lopes *et al.*, 2007). Similarly to the role emotional, the role physical is reduced in diabetic patients, further emphasizing the issue highlighted earlier of the co-existing nature of diabetes and kidney disease, which is extremely debilitating (Table 4.9).

The overall symptom score for all patients participating in the study was the highest reported QOL score out of all the QOL scores in this study, which emphasized that patients are least affected by the dialysis-related symptoms, such as muscle cramps, pruritus and anorexia, or access problems (Table 4.6). The highest reported symptom was feeling washed out and drained. The lowest cited symptom was chest pain. Despite the inefficiencies of dialysis to replace kidney function, dialysis and the management thereof has enabled patients overall to be less symptomatic. Dialysis patients reported a lower effect of kidney disease score. The effect of kidney disease score is an accumulated score of the effect of fluid and dietary restrictions, the ability to travel, and their dependency on doctors. The inability to travel was rated highest in this survey, which indicates that patients feel confined and trapped to their dialysis unit where they receive their care; although, being dependent on doctors and medical staff was rated as having the least impact on patients. The burden of kidney disease score was the worst reported score and therefore has the greatest effect on dialysis patients (Table 4.6). The burden score is associated to the time consumed by dialysis and its intrusiveness and degree of burden to the family (Mazairac *et al.*, 2012).

In comparison to a study done in Brazil, also a developing country, they reported a slightly lower overall score for MCS and a higher PCS for the 627 RRT patients surveyed. A probable reason for the higher PCS was that the average age of the population was younger, compared to the sample in this study. As seen in this study, as well as other published research, increasing age has been reported to lower the physical functioning and the PCS, as well as the presence of diabetes. However, the prevalence of diabetes was similar in the Brazilian study and this study. The majority of the patients in this study were within their first year of dialysis, in comparison to the Brazilian study, in which patients were on dialysis for much longer (an average of 3.9 years). This may explain the MCS difference between the two study groups. The MCS score has shown to decline with the number of years on dialysis.

Type of modality has been shown to be associated to QOL. However, it should be said that the studies on the differences of QOL between HD and PD remain controversial. Some studies have reported no significant differences, while others have reported differences in certain domains (Finkelstein *et al.*, 2009; de Abreu *et al.*, 2011).

This study has shown that there was no significant difference in unadjusted QOL scores between the HD and PD group, with the exception of two scores. The vitality (energy/fatigue) score, which is further described above, was found to be higher in the HD group compared to the PD group (Table 4.8). The vitality scores are important as they are further related to social interaction. A reduced vitality score is usually associated with social isolation; therefore, improving the vitality score is important for the patients and society to thus have actively engaged members of society (Fukuhara *et al.*, 2012). For many patients, in-centre HD is seen as social interaction as patients often see each other and develop friendships and a support network, in comparison to at-home PD patients, who are usually isolated from fellow patients and other people unless they have a very good home support. Within this study, the effect of kidney disease was shown to be significantly different in the two modalities - with in-centre HD patients reporting kidney disease to have a greater effect on their lives, when compared to home-based PD, which was to be expected (Table 4.8). Haemodialysis patients have greater fluid and dietary restrictions, a reduced ability to travel, and a greater dependency on doctors. All the remaining scales were not significant (Table 4.8).

These study results were compared to two similar studies - firstly in China, which consisted of a larger cohort of 654 HD patients and 408 PD patients across ten units. Dialysis was funded for everybody by the government in China, although there may have been a co-payment of between 10 and 50 percent. Peritoneal dialysis was

promoted as first-line therapy and haemodialysis only for those unable to do PD (Zhang *et al.*, 2007).

The second study was one recently published in Cape Town, South Africa, which was a single centre study with a much smaller sample size of 56 HD patients and 26 PD patients. This study took place in the public healthcare sector. All dialysis in the public sector was funded by the government, however dialysis is rationed with only the selected few who qualify gaining access to dialysis (Okpechi *et al.*, 2013).

When comparing the QOL in HD patients in the three studies, the Cape Town public unit patients had the highest QOL scores, followed by the patients in the current study. Patients in the China study had the lowest QOL score for all domains. Again for the PD patients, the Cape Town PD patients had higher QOL scores; although when compared to China, reduced emotional well-being, social function, and energy/fatigue scores were seen in the study.

The variation in score is probably associated with funding, the availability of dialysis, and age. In China, dialysis is available to all, whereas in the Cape Town study funding it was available to those qualifying. In this study it was available to all who could afford the cost of private healthcare monthly payments (Clark *et al.*, 2013). The dialysis patients in Cape Town are reflective of the public healthcare sector where dialysis is rationed to fitter, 'transplantable' patients, and is therefore representative of a younger 'healthier' kidney disease population who are mostly without significant co-morbid disease - although the Cape Town study was limited by its small size (Okpechi *et al.*, 2013). The Chinese patients were older and both this study's patients and the Chinese patients were older than the patients in the Cape Town study. Age has been known to be associated with PCS and related scales (Figure 5.1; Figure 5.2).

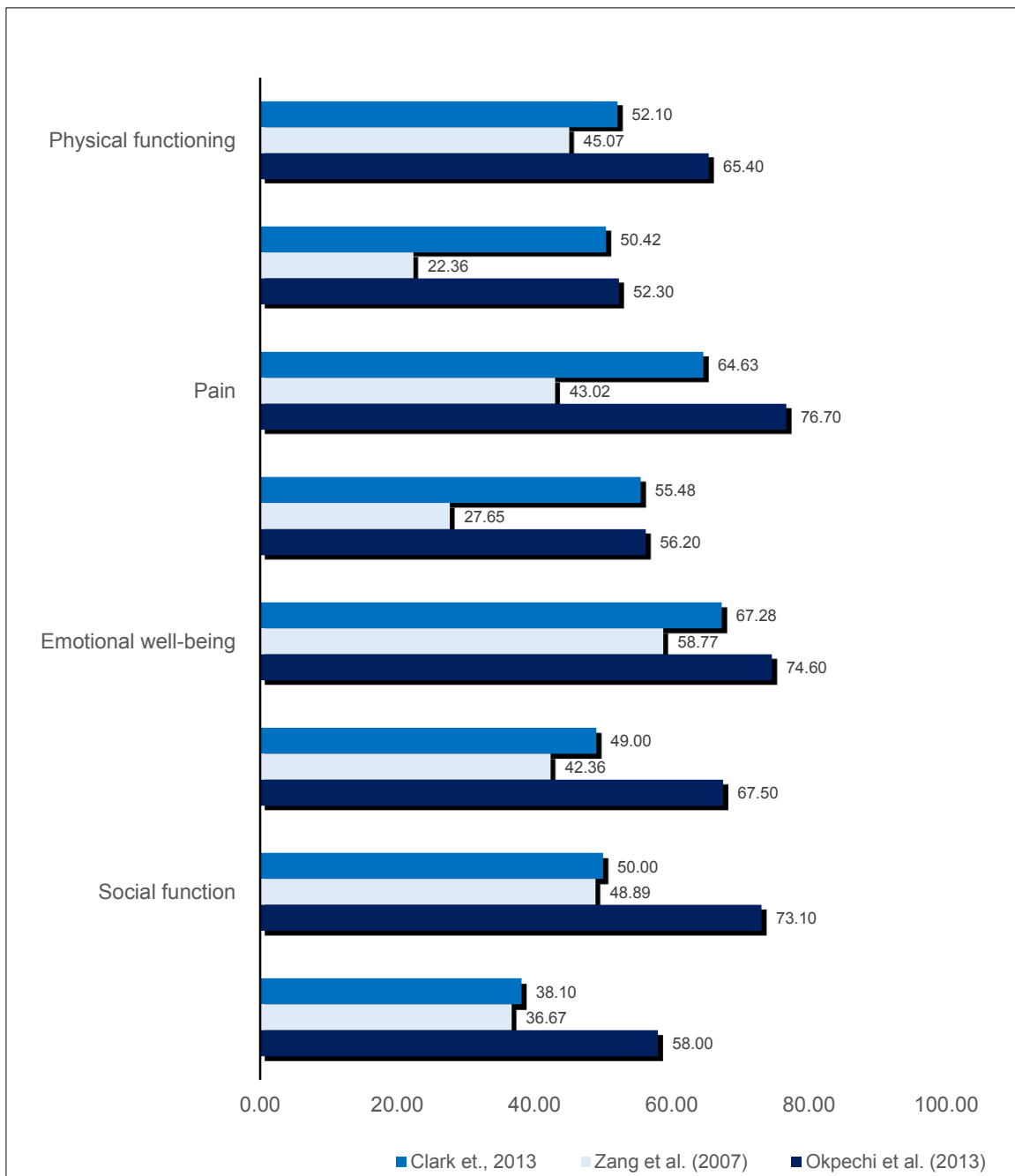


Figure 5.1 Correlation of the physical and mental composite scales in haemodialysis patients between three studies (Clark *et al.*, 2013; Zhang *et al.*, 2007; Okpechi *et al.*, 2013).

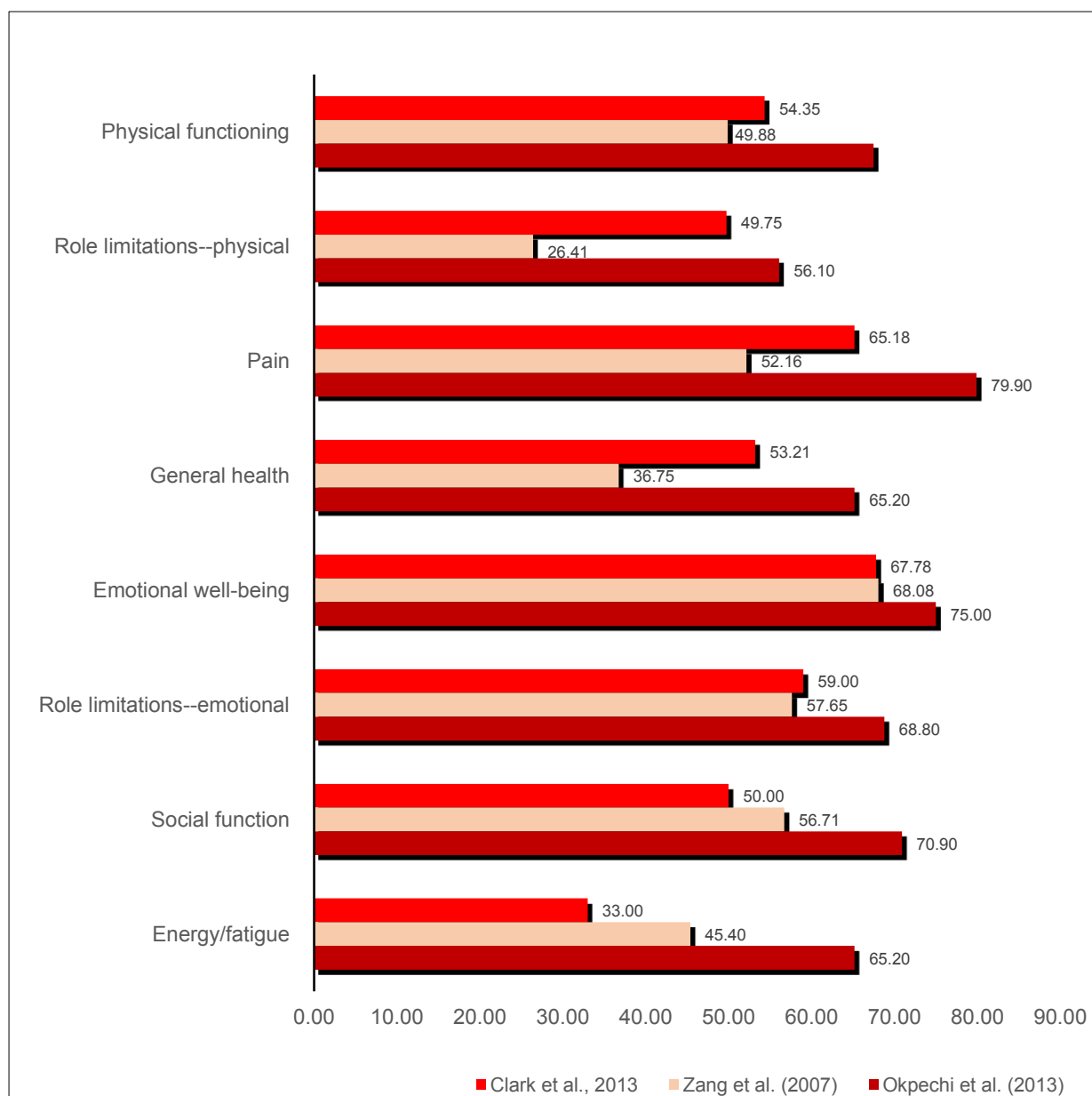


Figure 5.2 Correlation of the physical and mental composite scores of peritoneal dialysis patient in three studies (Clark *et al.*, 2013; Zhang *et al.*, 2007; Okpechi *et al.*, 2013).

Although the differences in the studies made it difficult to compare findings, there were still enough similarities to provide an insight into the comparability of QOL between developing countries and from an international perspective.

Upon further analysis in the current study, multiple regression was used and the significant ($p < 0.05$) and marginally significant ($p < 0.1$) variables were taken through further analysis with the use of ANCOVA. The adjusted symptoms of kidney disease (Figure 4.12),

effect (Figure 4.13), and burden of kidney disease (Figure 4.14), along with the PCS (Figure 4.15), were all statistically significant, with the exception of the MCS which was found not to be different between modalities. Peritoneal dialysis patients showed an improved symptom, effect, and burden of kidney disease score. In comparison, HD patients had an improved PCS score, particularly an improved vitality (energy/fatigue) score.

An improved symptom control score was seen for PD, compared to the HD's score, following the adjustment of the symptom score of QOL for age (Figure 4.12). Peritoneal dialysis patient experienced fewer symptoms when compared to HD patients. This can be expected due to the continuous, subtle nature of PD. Peritoneal dialysis is performed on average four times a day every day, in comparison to HD which is done three times a week for four hours, thus resulting in a more dramatic change in fluid and electrolyte management, an increase in reported muscle cramps and a feeling of being washed out and drained after dialysis (Table 4.7). Many HD patients require a rest period post-dialysis to recover and the muscle cramps are a result of constriction of intramuscular arteries in response to depletion of intravascular volume (Nissenson and Fine, 2008). Research has shown peritoneal dialysis patients on automated peritoneal dialysis (APD) have even less symptoms and a greater QOL, as APD is performed at night time while the person sleeps (Kimmel, 2012).

Haemodialysis patients further reported a greater incidence of itchy skin (Table 4.7). The most common cause of dry, itching skin is secondary to hypercalcemia and hyperphosphatemia, which may cause skin calcification and stimulation of local mast cells with consequent release of histamine. It may also be secondary to a low grade hypersensitivity to products used in dialysis, or inadequate removal of middle molecular weight toxins, i.e. inadequate dialysis. It may be improved with an increase in dialysis time and/or frequency, hence the reduced prevalence in PD patients. Peritoneal dialysis patients have a higher percentage of patients with a calcium/phosphate product <4.4 and a greater percentage of patients within the targeted range for phosphate (Table 4.4, Table 4.5 and Table 4.7). The majority of HD patients are on four hours dialysis because of limited funding. With increased funding, dialysis could be provided to achieve targets; thus symptoms may improve on HD as dialysis time can be increased up to five hours, which occurs in developed countries like Australia.

The associated poor outcomes of dialysis has led to the development of alternative therapies, which involves increasing the dose of dialysis with the extension of time on dialysis for up to eight hours and increasing the frequency of haemodialysis to daily dialysis. The advantages of increasing dialysis time is more effective volume and blood pressure control, improvement in

calcium phosphate metabolism, anaemia and sleep disorders, and better maintenance of hemodynamic stability because of slower ultra-filtration and the removal of uraemic toxins that do not behave like urea (Zsom *et al.*, 2008). Unfortunately, in South Africa the introduction of these therapies is limited due to available resources and funding. Nocturnal haemodialysis, i.e. eight hours of dialysis, was introduced in the private sector and has shown promising results in terms of outcomes, although available only to a selected few.

As described above, when the effect of kidney disease was adjusted for albumin, it remained significant and HD patients reported a greater effect of kidney disease. The most frequently cited stresses from 29 physiological and psychological stressors associated with dialysis are dietary and fluid restrictions (Lam *et al.*, 2010). Research has shown that dietary and fluid restrictions place a tremendous burden of stress, anxiety, and fear on patients. It has further shown to curtail social interaction and place strain on families (Hagren *et al.*, 2001). The continuous nature of PD enables a reduced restriction of diet and a greater fluid allowance. Similarly, home HD and increased time on dialysis enables fewer restrictions in terms of diet and fluid. In addition, home-based PD patients have the benefit of flexible scheduling of dialysis and the ability to travel, without the need to arrange dialysis elsewhere, which provides patients with a greater sense of independence (Carruthers and Warr, 2004). Peritoneal dialysis patients have further reported being less dependent on doctors and medical staff, which is probably associated with the reduced interaction PD patients have with medical staff in comparison to HD patients' reliance on them for their dialysis schedule.

Again, PD dialysis patients had an improved burden of kidney disease score compared to HD patients when adjusted for urea, creatinine and albumin (Figure 4.14). Dialysis itself has shown to be a huge burden for patients (Boini *et al.*, 2011). The minimum four hours dialysis treatment, along with the travel time to a dialysis unit, is time-consuming which places an additional burden and strain on the kidney disease patient. In-centre HD has been shown to be more intrusive than home-based PD as the majority of HD patients reported kidney disease interfering excessively with their life, compared to the minority of PD patients. Research has demonstrated that PD patients generally assume a new approach to living, which involves re-establishing roles and activities, organising their life around PD, and integrating PD into their existing lifestyle (Baillie *et al.*, 2012).

The majority of HD and PD patients report not placing any additional burden on their families. The effect and burden of kidney disease on family members is not a frequently researched topic. However, available research has shown that dialysis is associated with sub-

optimal QOL ratings in families. Haemodialysis and PD tend to evoke a state of negative ratings including anxiety, concern, fear and anger, and ultimately leading to exhaustion of family members. Despite the reported impact dialysis has on the patients' families, no differences have been reported in terms of type of therapy, in-centre HD or home-based PD (Baillie *et al.*, 2012).

Overall PD patients demonstrated an improved symptom, burden and effect of kidney disease score when compared to HD patients. The benefits seen from home-based PD has also been reported in home HD. Home HD patients are able to increase their frequency of dialysis and length of time on dialysis. The QOL in home HD patients has been reported to be superior to in-centre HD patients, and to more closely resemble those seen in patients with a successful kidney transplant (Blagg, 2005).

In this study HD patients did however report an improved QOL for PCS adjusted for age, urea, creatinine and albumin (Figure 4.15). The PCS, in particular the vitality score as described above, improved in HD patients. The vitality score reflects social interaction.

Despite the improved PCS, a greater percentage of HD patients reported that their health limited them significantly in terms of completing strenuous, moderate and mild activities when compared to PD patients. Research has shown that HD patients with a permanent venous catheter for their dialysis access report lower levels of physical activity than PD patients and HD patients who have an arteriovenous fistula or graft as their dialysis access.

The PD patient group reported an improved MCS when compared to the HD group - although not significant (Figure 4.16). The majority of HD patients felt they accomplished less because of their emotional problems, including feeling depressed and anxious. The incidence of anxiety and depression in HD patients is well recognised. The dialysis procedure itself is a stressful event, particularly if in addition to firstly, a lack of education and secondly, PESKD management - which is evident in the study (Alsherif and Mohammad, 2012).

Focusing now on aspects of pre-dialysis education, from the evaluation of knowledge of CKD patients the results drew attention to the differences of perceived knowledge between in-centre HD and home-based PD patients. Peritoneal dialysis patients had a better knowledge and understanding of their disease and dialysis. They had a greater understanding of anaemia management compared to HD patients (Table 4.10). A probable explanation for this is that home-based PD patients are responsible for their own anaemia management in terms of administering their ESAs, compared to HD patients who receive their medication

intravenously during in-centre dialysis. It was generally administered by the renal practitioner. Interestingly, there were no significant differences in the percentage of patients within the targeted range for haemoglobin, ferritin and transferrin saturation (Table 4.5) - although it is also important to recognise the limitations of interpreting these variables in this study. This is because both haemoglobin and iron studies were a once-off measurement and these variables change; they are also a single variable within a pool of multiple variables linked to anaemia. Other causes of anaemia include hypothyroidism, active blood loss, potentially through the HD circuit or gastrointestinal bleed, hyperparathyroidism, and folic acid and vitamin B12 deficiency.

Conversely, HD patients had a greater knowledge on other aspects of dialysis. These included dietary management, bone disease, and the complications of CKD (Table 4.10). A likely reason may be the greater diet and fluid restrictions imposed on HD patients, compared to PD patients. Furthermore, a greater number of HD patients reported a higher incidence of symptoms and hence a greater number of complications. From these findings, the importance of these results in gaining a greater understanding of patient's knowledge of their disease is evident. The value of these findings lies in what can be done with them; one would be to recognise these areas of poor knowledge, which could inform future educational interventions.

A person's perception of their knowledge and what they actually know are not the same construct (Figure 4.26). It is therefore important to regularly reassess a patient's knowledge, as improved knowledge has been shown to be associated with improved outcome. Consequently, effective patient-provider communication influences patient satisfaction with care, and significantly contributes to treatment adherence, which in turn has shown to contribute to improved QOL (Wright Nunes *et al.*, 2011). Thus once-off measurements of QOL have their limitations. It is for this reason that they should be carried out serially with other dialysis adequacy measures which are done three to six monthly.

It was also evident in this study that the majority of patients, and in particular HD patients, did not benefit from a PESKD management programme. This fact may be an ongoing contributor to the stressful nature of dialysis, as was outlined by Alsherif and Mohammed (2012). The reason, as highlighted in their study, was related to the lack of awareness of the condition, which was evident in a large number of patients, particularly HD patients (Figure 4.4). An additional factor contributing to the low awareness may be the asymptomatic nature of CKD until very late in their disease. Many patients go undiagnosed until they are in the advanced stages when dialysis is required (Lingerfelt and Thornton, 2011). This was further reflected in a study where a large percentage of patients

had not been managed by a nephrologist or physician prior to commencing dialysis. Similarly, the United States Renal Data System (USRDS) highlights late referral as a problem. They reported that the majority of HD patients, and an even higher number of PD patients, were being seen by a nephrologist ≤ 3 months prior to the onset of RRT. Patients who are referred late do not benefit from the advantage of early detection and management. Early detection and management programmes focus on delaying the progression of CKD, prevention or attenuation of co-morbid conditions (such as heart disease and diabetes), cardiovascular risk factors (including hypertension and dyslipidaemia), and management of uraemic complications (such as anaemia and renal osteodystrophy) (Thilly *et al.*, 2009). They also focus on education and awareness regarding the disease.

Importantly, PESKD has further been shown to be significantly related to general health once dialysis has commenced. Patients who participated in a PESKD management programme had a reduced effect and burden of CKD once dialysis commenced. In comparison, patients being managed by a physician/nephrologist showed marginal significance in the improvement of general health once dialysis has commenced (Table 4.9). Therefore, the participation in a PESKD management programme with physician/nephrology input should be mandated to maintain QOL; this intervention may directly improve morbidity and mortality.

Patient well-being has shown to be further enhanced through patient education (Finkelstein *et al.*, 2009; Wright Nunes *et al.*, 2011). This study in particular has shown that patients who participated in the PESKD management programme had an improved knowledge in a number of areas of kidney disease and dialysis management. They had a better understanding and knowledge of fluid management, anaemia management, cardiovascular disease, bone disease, access management, medication, and complications of CKD when compared to patients who were managed by a nephrologist/physician alone prior to commencing dialysis (Table 4.11). The largest reported barrier to patient education is time constraints, particularly physicians' time constraints. In Africa, the number of nephrologists in relation to the general population is one of the lowest reported in the world with respect to a high-income developing country (Katz *et al.*, 2011). Similar countries, such as Brazil and Turkey, have much higher numbers of renal specialists who are able to take up this task.

Early referral and patient education has further shown to influence a patient's choice of treatment (Key, 2008; Boini *et al.*, 2011). In the study it was found that despite the majority of patients being presented with all the treatment options, a large number of patients were not presented with all the treatment options. In fact, not all patients felt they had chosen or elected their own modality of

dialysis treatment (Figure 4.5). The USRDS Wave Study reported that only a quarter of HD patients could remember receiving information on PD (Key, 2008). Patients referred late do not have sufficient time for education on the treatment modality. Late-referred patients are further compounded by a compromised condition and need for vascular access, and often, urgent dialysis. The majority of patients requiring urgent dialysis are placed on HD with a temporary access. There is a significant logistic effort to switch the patient to PD; patients, however, become comfortable with what they know and do not want to change dialysis type. Late referral can cut the incidence of PD use by 50%, thus depriving the patients a chance at a home-based therapy (Key, 2008).

In a developing country, choice of dialysis in the public healthcare sector is non-existent. The decision is mostly made by the healthcare provider based on availability of dialysis and the patient's socioeconomic condition. In the private healthcare sector, choice of in-centre HD or at-home PD is not restricted but may be influenced by financial gain. There is an opportunity for a greater income for doctors treating a patient on HD, which has resulted in many more patients on HD than on PD in the private sector (Okpechi *et al.*, 2012). A similar situation is seen in the United States. Here the Medicare payment system pays similarly for either modality. Although this may appear to be attractive to either modality, perhaps making PD more attractive due to the associated costs of maintaining an HD center. However the cost of maintaining an HD facility has encouraged clinicians to direct patients to in-centre HD to fill all available machines, as the expense of the dialysis slot exists whether filled or not and it becomes more profitable (Key, 2008). This is a feature of dialysis in South Africa and was demonstrated by Katz *et al.* (2010) in which a mere 23 PMP were receiving PD, in comparison to almost double that amount of 45 PMP on haemodialysis. There was also a significant growth in private HD units around that time, which further favoured in-centre HD.

Choice of dialysis is crucial as very few medical decisions have shown to have as profound an effect on every aspect of a person's life as the decision of the type of dialysis modality (Mehrotra, 2011).

Patients are living longer on dialysis, despite the decrease in survival for every year on dialysis, which was seen in this study. There were decreasing patient numbers with increasing years (Figure 4.6). Therefore, choice of dialysis is even more important (Hutchinson, 2005; Nakai *et al.*, 2007). With the increasing number of patients and the increasing length of time a patient will spend on dialysis, maintaining and improving QOL is essential. There have been a number of studies which have indicated that the best pathway to follow is to start with PD as the first modality and then

to progress to HD (if not transplanted early) or when the need arises because of PD modality failure. Those patients starting on PD and ending with transplant after a HD had the longest periods on dialysis (Snyder *et al.*, 2002; Carruthers and Warr, 2004; Okpechi *et al.*, 2012)

Transplantation has shown to offer the best QOL in terms of RRT (Álvares *et al.*, 2012; Garcia *et al.*, 2012). However with increasing patient numbers and a shortage of organ donors, the length of time a patient will wait for a transplant is increasing (Sever, 2006; Stanley, 2010). Transplantation is limited in Africa, with only a few centres offering transplantation. The transplant rate in South Africa is 9.2 PMP and is limited by cost, donor shortages, the lack of a brain-death law, and religious, cultural and social constraints (Katz *et al.*, 2011; Garcia *et al.*, 2012).

In this study only the minority of patients were awaiting transplant. The reason for this was outside the scope of this study. It was probably related to the stringent criteria for transplantation, resulting in several patients not being suitable for renal transplantation. In conjunction with improvement in dialysis therapies and clinical outcomes, some patients eligible for transplant are opting for dialysis, instead of transplantation. Fear of surgery, the side-effects of immunosuppression, and scepticism that renal transplantation can offer improvement of QOL have been reported by patients as being reasons for opting out of transplantation (McFarlane, 2010).

However, those patients on the transplant list did present with an improved MCS. These patients had a sense of hope that a functioning kidney will provide them with a second chance in life and restore their QOL. This may explain this finding. It may, however, also be that those patients suitable for transplant are generally fitter and with less co-morbid disease. This alone would impact on a better QOL score.

Quality of life is equally important when considering a conservative pathway, which is an option for some people especially considering the existential struggle associated with ESKD. The majority of nephrology professionals felt that a non-dialysis pathway should be discussed with appropriate patients (including elderly patients and patients with advanced HIV). However, only the minority did discuss a non-dialysis pathway with their patients who may have benefited from this non-dialysis pathway. This is an area of nephrology now receiving much attention (Hagren *et al.*, 2005).

Patients with CKD can have a significant diminished QOL associated with a high symptom burden and complex co-morbidities; therefore, a conservative pathway may be their preferred choice. For some patients, dialysis is seen as a constant

reminder that they are living on borrowed time (Hagren *et al.*, 2005). For others, it is simply an unbearable option. The fact that ESKD is a difficult disease to live with was borne out in the fact that nephrology professionals rated the difficulty of living with kidney disease a 7.49 out of 10 score, with 10 being the most difficult. Nephrology professionals need to create possibilities within a nursing practice to meet CKD patients' needs, continuously exploring ways to improve patient's education, choices and the overall QOL of these patients (Hagren *et al.*, 2001). Health-related quality of life is a key indicator of how kidney disease affects the patient's life; therefore, the study was an ideal marker for the detection of potentially modifiable factors related to QOL. The potentially modifiable factors demonstrated in the study were early management, particularly pre-end stage kidney disease management, patient education and treatment modality.

5.4 Study limitations

It was fortunate that all study objectives were achieved but despite this some limitations to the study should be taken into consideration when interpreting the findings documented.

The study was an observational study. It enabled the measurement of QOL in relation to the patient's dialysis modality and included associated indicators. The study was therefore unable to demonstrate strictly causal relationships.

The study was mainly reflective of the private healthcare sector and therefore did not take into account the public healthcare challenges, nor is it likely representative of the entire South African dialysis population.

The study was not a longitudinal study; quality of life was assessed at a single point in time. It would make sense, and evidence has shown that QOL could change over time.

No PD patients who participated in the study were on APD at the time the study took place. Evidence has shown QOL is improved in APD patients.

Haemodialysis patients in the study were on a maximum four hours dialysis, three times a week, due to limited funding for dialysis in South Africa.

The biochemical results were recorded within three months of the QOL survey, but they were a single result and therefore may also not be an average reflection of the biochemical parameters.

The reported co-morbid conditions were limited and the study may have benefited from the inclusion of a co-morbidity index score.

In addition, patients not suitable for a particular modality were not taken into account when analysing whether all patients were informed regarding all treatments options.

The quality of pre-dialysis care, including time of referral and the number of visits to a pre-dialysis centre and/or nephrologist, was not included in the study due to limited data in patients' records, however, research has shown an association to quality of pre-dialysis care and patient outcome (Boini *et al.*, 2011).

Residual renal function (RRF) was not measured. Residual renal function has been associated with a reduction in blood pressure, left ventricular hypertrophy, increased sodium removal, improved fluid status, increased B₂-microglobulin levels and higher haemoglobin levels, better nutritional status and decreased circulating inflammatory markers. Preservation of RRF contributes to achieving adequate dialysis targets, improved serum phosphate levels, higher bicarbonate levels and improved lipid profiles. Improved QOL has been reported in patients with RRF, particularly in physical functioning, vitality, kidney disease specific symptoms, and daily life and sleep disorders (Marrón *et al.*, 2008).

Furthermore, dialysis access survival rates and first access placement were not recorded in the study and therefore not related to QOL; instead the study focused on the total number of access placements.

Patients' perceived knowledge was assessed, however, it may have been of greater advantage to measure a patient's perceived as well as objective knowledge. This would most likely have improved the understanding of the level of knowledge found in kidney disease patients. It is also possible that education may have been given, but not recalled, therefore future studies may want to address the impact of patient education programmes on actual, rather than perceived knowledge.

Chapter 6 Conclusion

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Dialysis in a developing country is dictated by socioeconomic conditions and available funding, thus very few patients are offered dialysis. The public sector is governed by so-called “life and death” committees, while the private sector is a reflection of disproportionate access to care by the higher income group. Therefore, if dialysis is provided in a developing country with limited resources, it should be ensured that it improves not only quantity of life, but also quality of life (QOL).

The health-related quality of life (HRQOL) measurement must be mandated in South Africa, where dialysis is only available to a select few. Traditionally effectiveness in achieving the goal of healthcare has been measured in preventing disease and relieving it when it is present by treatment outcomes. Treatment outcomes are defined in terms of extending life. However, the impact of treatment occurs in the context of a patient’s life and overall health condition, including the existing comorbidities. Therefore, through assessing QOL, a more comprehensive measurement of life and a greater understanding outside the context of the clinical outcome framework is gained.

The current study showed that QOL was compromised in dialysis patients. A reduced QOL score, in particular the physical composite score (PCS), was associated with an increase in age. Diabetic patients had a reduced emotional role score, emphasizing the debilitating nature of diabetes and kidney disease combined. In addition, the longer a patient was on dialysis, there was a corresponding decline in the patient’s emotional well-being. The type of modality of treatment showed to further influence QOL. Overall peritoneal (PD) patients had an improved QOL score - in particular, an improved symptom score adjusted for age, a reduced effect of kidney disease adjusted for albumin, and a burden of kidney disease score adjusted for urea, creatinine and albumin, when compared to haemodialysis (HD) patients. Haemodialysis patients did, however, show improved PCS and increased vitality. It was also notable that there was no significant difference between HD and PD patients in the mental composite score (MCS).

There were, however, unique differences between HD and PD patients. The PD patients were significantly older with a greater prevalence of cardiovascular disease. The study further indicated

that the majority of PD patients were aware of their kidney disease and were managed accordingly prior to dialysis. In addition, the majority of PD patients participated in their choice of dialysis modality; this awareness and its impact on QOL therefore stresses the importance of pre-dialysis education.

The current study has highlighted the benefits of early referral to a physician/nephrologist, along with a pre-end stage kidney disease (PESKD) programme. The importance of a PESKD programme is twofold in a high income developing country like South Africa - first is to screen and detect disease to reduce the burden of CKD through awareness, management and prevention. This is because CKD has shown to be a low awareness and high prevalence condition. Second is to improve patients' management when they have the disease; if they do progress to require dialysis then their choice of RRT will be well informed. Thus, the preparation for dialysis will be planned well in advance before commencing with it. Early referral, i.e. >3 months before starting dialysis, will ensure a patient is given the best chance of survival in an area usually characterised by poor clinical outcome. The importance of early referral is emphasized in this study as patients managed prior to dialysis displayed better QOL scores; this was evidenced by the improvement in their general health once dialysis had commenced. Participation in a PESKD management programme has shown to reduce the effect and burden of kidney disease once dialysis has commenced.

An interesting observation is that patients who participated in a PESKD management programme showed improved knowledge when compared to patients managed by an attending physician/nephrologist, therefore reiterating the importance of a PESKD programme. A PESKD programme, along with nephrological support, provides a patient with individualised treatment. Furthermore, it will ensure that a patient is adequately managed with continuous support, thus ensuring the best option for end stage kidney disease patients. Equally important was to ensure ongoing training as greater knowledge of kidney disease management and associated complications had an improved PCS, burden of kidney disease and symptom control score.

Another important and perhaps not so surprising finding in this study was the importance of ensuring that those patients who are suitable for transplantation are worked up and placed on the transplant list. This resulted in better QOL. Transplantation is the preferred renal replacement therapy (RRT), however, the availability of transplantation worldwide and especially in developing countries is severely restricted by poor procurement systems and the overall shortage of organ donors. Despite this major challenge and long waiting times for transplants, those patients awaiting transplantation reported an improved mental

health composite score (MCS), most likely indicating a sense of hope.

There were differences in QOL in patients on different dialysis modalities; these issues need to be addressed to ensure QOL continues to improve. In addition, attempts should be made to better understand the differences between HD and PD patients and, if possible, these differences should be reduced. If this is not possible, then these differences should at least be taken into account when advising a patient on the best dialysis modality during pre-dialysis education. In future the focus, when collecting QOL data, should always be on developing strategies to improve the compromised QOL of dialysis patients. It is also important to produce the evidence and develop the methodology to enable improvements in outcome, along with a reduction in morbidity and mortality - the latter being the real "Holy Grail".

Chapter 7 References

Chapter 7 References

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Chapter 8

Appendices

Chapter 8 Appendices

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Appendix A: Experimental consent form

QUALITY OF LIFE OF CHRONIC DIALYSIS PATIENTS

Researcher: Chevon Lee Clark
Contact number: 0767143300

Dear Research Participant

You are invited to participate in a research study. This information leaflet will help you decide on whether you would want to participate. Before you agree to take part, you should fully understand what is involved in this study. You should not agree to participate unless you are completely satisfied with all procedures of the study.

Information on the study:

Scientific innovations along with the development of renal replacement therapy (including dialysis and transplantation) have made it possible to prolong the lives of patients with end stage kidney disease (ESKD).

End stage kidney disease is a chronic illness with profound effects on a patient's life, with serious physical, mental and financial implications for the individual, family and community.

Health related quality of life (HRQOL) is an important and potentially overlooked component of the disease experience of chronic dialysis patients.

Quality of life measures summarize people's subjective experiences regarding health and disease; it is a concept that expresses the extent to which the disease limits a person's capacity to lead a "normal" life.

This study aims at investigating the HRQOL of chronic dialysis patients in relation to clinical outcomes and patients knowledge of ESKD.

Recognizing the impact of HRQOL will enable clinicians (such as kidney specialists and other practitioners) to better manage patients and improve outcomes on dialysis and ultimately and most importantly lead the way to improving the well-being of our dialysis population and optimizing dialysis therapy.

What are you required to do during the study?

If you decide to take part in the study, you will be requested to do the following:

- To sign this informed consent form
- To complete a chronic dialysis patient questionnaire, this consists of completing your personal details, your medical and family history and your understanding on the management of your disease. The unit coordinator or researcher may assist you in completing the personal information. The questionnaire consists of 4 pages and will take approximately 10 minutes to complete.
- To complete a quality of life survey, this is based on the Kidney Disease Quality of Life Short Form (KDOQI: SF-36) which was developed to take into account particular concerns of patients with kidney diseases and ESKD. It is a multidimensional, reliable and validated questionnaire specifically designed for dialysis patients. The questionnaire consists of 6 pages of short questions and will take approximately 15 minutes to complete.
- Your blood result tests will be collected within 30 days of you completing the questionnaire, by the researcher. No extra blood tests will be taken, only your routine blood test results as prescribed by your doctor will be used for the research project.

The questionnaires used in this research project will only need to be completed once. Some questions asked may be of a sensitive nature.

What are the risks associated with the research project?

There are no risks associated with the research project, only your routine blood results will be used, no additional blood tests will be taken. Your dialysis prescription will remain the same and in accordance to your doctor's prescription. All of your information supplied will be kept confidential. Your identity will only be known to the researcher. Information supplied will be coded by means of a numerical value to protect your identity. Your identity will not be revealed during or even after the study.

What are your rights as a participant in this study?

Your participation in this study is entirely voluntary. You have a right to withdraw at any stage without any penalty or future disadvantage. You will not need to provide any reason/s for your

decision to withdraw from the study. Your withdrawal will in no way influence your continued care and relationship with the health care team.

What are the potential benefits that may come from the study?

By participating in this research project you are contributing towards establishing more knowledge in the healthcare industry on health related quality of life and leading the way to improving the well-being of dialysis patients and optimizing dialysis therapy.

Your co-operation and participation in the study will be greatly appreciated. Please sign underneath informed consent if you agree to participate in the study.

Informed consent

I hereby confirm that I have been adequately informed by the researcher/unit coordinator about the nature, conduct, benefits and risks of the study. I have also received, read and understood the above written information. I am aware that the results of the study, including personal details regarding my age, health status, medical history, treatment and quality of life will be anonymously processed into a research report, therefore I give consent to the researcher to access my medical record information and to use the information needed in this study. I understand my participation is voluntary and that I may, at any stage, without prejudice, withdraw my consent and participation in the study. I have had sufficient opportunity to ask questions and have received satisfactory answers to my questions. I voluntarily agree to participate in this research.

Participant name

Participant signature

Date

The research project and informed consent was explained to be by:

Researcher / Unit coordinator name

Research / Unit coordinator signature

Date

Appendix B:

Questionnaire: Chronic dialysis patients

QUALITY OF LIFE OF CHRONIC DIALYSIS PATIENTS

Researcher: Chevon Clark

Patient details

Name: _____

Age: _____

Sex: _____

Race: _____

Occupation: _____

Employment status: full-time / part-time / self-employed / retired
/ unemployed**Do you live alone:** Yes / No**Do you participate in any activities:** Yes / NoIf yes please specify: _____
(Sports / hobbies / community activities)**Do you have any habits, such as smoking, drinking alcohol?**

Yes / No

How far away do you live from the renal unit?

0 – 10km 11 – 20 km 21 – 30 km 31 – 40 km 41 – 50 km

Greater than 50km

Spiritual:

Religion: _____

How would describe your relationship with your God?

None Poor Average Good Excellent

Family medical history

	Yes	No
Has any immediate family member (father, mother, brother, sister) suffered from:		
Hypertension		
Heart conditions		
Diabetes		
Kidney conditions		

Previous medical history

	Yes	No
Do you have any of the following medical conditions:		
Diabetes		
Hypertension		
Do you take blood pressure tablets?		
Heart conditions		

Development of kidney impairment

	Yes	No
Were you informed about kidney failure prior to developing kidney failure?		
If yes, were you aware of how to manage your kidney impairment/damage and to slow its progression to advanced kidney disease/end stage kidney disease (ESKD) and dialysis and to reduce and manage the associated complications which occur with ESKD?		
Did you take part in a pre-end stage kidney disease program?		
Did you participate in any support groups offered?		
If yes, did you feel that these meetings were beneficial?		
Do you have support from your family and friends?		
Do you feel that educating a person about kidney failure is beneficial prior to development of kidney failure?		
Do feel enough awareness is created about kidney failure?		

Treatment of kidney failure

When did your kidney failure start?

When did you start chronic renal replacement therapy?

What do you think is the cause of your disease?

Have you been admitted into hospital within the last 3 months?

When you first started dialysis did you:

Accept your kidney failure or were you in denial?

If on hemodialysis:

How often do you attend dialysis?

1xweek 2xweek 3xweek 4x week More than 4 times

How long is your haemodialysis session?

2 hours 3 hours 4 hours 5 hours

Are you satisfied with the time you come for dialysis?

Yes / No

Were you always on hemodialysis and never on peritoneal dialysis?

Yes / No

How many temporary catheters have you had? -----

How many permanent catheters have you had? -----

How many fistulas have you had? -----

How many grafts have you had? -----

If on peritoneal dialysis:

Are you on:

Continuous ambulatory peritoneal dialysis (CAPD) or

Automated peritoneal dialysis (APD)

How many exchanges do you do daily?

3 Exchanges 4 Exchanges 5 Exchanges > 5 Exchanges

Have you ever had peritonitis? Yes / No

If yes, how many times in the last year? _____

How often do you see your doctor?

Every month Every 3rd month Every 6th month Yearly

Only when I have a problem

How often do you visit your dialysis unit?

Every month Every 3rd month Every 6th month Yearly

Only when I have a problem

Your perspective of your treatment:

	Yes	No
Were you presented and informed about all your treatment options?		
Were you informed about a non-dialysis, medical treatment only option?		
Did you choose your treatment?		
Are you satisfied with the treatment you have chosen?		
If yes why?		
Do you feel better after dialysis?		
Are you on the transplant list?		
In looking back would you consider a non-dialysis option?		

Management of your disease

	Yes	No
Are you aware of how to manage your kidney failure, with regard to:		
Fluid intake “the amount of fluid you are allowed”		
Dietary allowances “the food you are allowed to eat”		
Is your diet and fluid intake free of major restrictions?		
Anaemia management “your EPO and iron”		
Cardiovascular management “looking after your heart”		
Bone disease “taking care of your bones”		
Do you take phosphate binders?		
Taking care of your access		
Adequate dialysis		
Do you know what medications you are taking and why you take them?		
Do you know how to prevent and manage complications associated with kidney failure?		

Appendix C:

Quality of life survey (KDQOL: SF-36™)

Please circle or cross the answer that best suits your situation

1. How would describe your health?

Excellent¹ Very good² Good³ Fair⁴ Poor⁵

2. Compared to a year ago how is your health now?

A lot better¹ Slightly better² The same³ Slightly worse⁴ A lot worse⁵

3. Does your health limit you in any way in performing the activities listed below?

	Yes a lot ¹	Yes a little ²	Not at all ³
a. Strenuous activities, such as running or other sports?			
b. Moderate activities, such as cleaning, playing golf?			
c. Mild activities such as walking?			
d. Climbing several flights of stairs?			
e. Daily well-being activities such as bathing, dressing yourself?			

4. During the last month, have you experienced any of the problems listed below with your work or daily routine because of your health?

	Yes ¹	No ²
a. Decreased amount of time spent on work or activities because of your physical health?		
b. Were restricted in the kind of work because of your physical health?		
c. Accomplished less than you would have liked because of physical limitations?		
d. Accomplished less than you would have like because of emotional problems (such as feeling depressed, anxious)?		
e. Did not complete activity as carefully as usual?		
f. Does your health prevent you from working at a job you would like?		
g. Found tasks difficult		

5. In the last month to what degree did your health interfere with your social activities (like visiting with family or friends)?

Not at all⁵ Slightly⁴ Moderately³ Quite a bit²
Extremely¹

6. How much pain have you experienced in the last month?

None¹ Very little² Mild³ Moderate⁴ Severe⁵
Very severe⁶

7. In the last month how much did pain, if any interfere with your normal routine (including both work and home)?

Not at all¹ A little bit² Moderately³ Quite a bit⁴
Extremely⁵

8. How satisfied are you?

	Very dissatisfied ¹	Little dissatisfied ²	Little satisfied ³	Satisfied ⁴
a. With the amount of time you have to spend with family and friends?				
b. With the ability to take care of your financial needs?				
c. With your home, or place where you live?				
d. Your achievement of your personal goals?				
e. Your chances for a happy future?				
f. Your life in general				

9. How much time in the last month did you:

	All ¹	Most ²	Quiet a bit ³	Some ⁴	Little ⁵	None ⁶
a. Feel depressed						
b. Feel anxious						
c. Feel calm and peaceful						
d. Feel full of energy						
e. Feel downhearted and blue						
f. Feel happy						
g. Feel irritable						
h. Lack concentration						
i. Did you get along with everyone around you						
j. Did you get confused						

10. Please mark area that is applicable to you:

	Completely true ¹	Mostly true ²	Don't know ³	Mostly false ⁴	Definitely false ⁵
a. I get ill easier than other people					
b. I am as healthy as everyone else					
c. I predict my health to get worse					
d. My kidney failure interferes too much with my life					
e. Too much of my time is spent dealing with my kidney disease					
f. I am frustrated dealing with my kidney disease					
g. I feel like a burden on my family					
h. I am in control of my life					

11. In the last month how much did the following affect you?

	No effect ¹	Some ²	Moderate ³	Very much ⁴	Extremely ⁵
a. Muscles pain					
b. Chest pain					
c. Cramps					
d. Itchy skin					
e. Dry skin					
f. Shortness of breath					
g. Dizziness					
h. Lack of appetite					
i. Washed out or drained					
j. Numbness in hands or feet					
k. Nausea or upset stomach					
l. Problems with your access: Haemodialysis (fistula, graft, catheter)					
m. Problems with your catheter: Peritoneal dialysis					

12. How much does kidney disease bother you in each of the areas?

	No effect ¹	Some ²	Moderate ³	Very much ⁴	Extremely ⁵
a. Fluid restriction					
b. Diet restriction					
c. Your ability to work around your house					
d. Your ability to travel					
e. Being dependent on doctors and medical staff					
f. Stress or worries caused by kidney disease					
g. Time spent on dialysis					
h. Your sex life					
i. Your appearance					

13. On a scale of 1 – 10, 10 being excellent and 1 being terrible how would you best describe your average sleeping pattern? _____

14. On average how many times to wake up at night? ____

15. Are you sleepy during the day? Yes / No

16. With respect to your dialysis:

	Completely true ¹	Mostly true ²	Don't know ³	Mostly false ⁴	Definitely false ⁵
a. I am satisfied with my care					
b. The staff support me					
c. The staff understand my needs					
d. It is just as much my responsibility to take care of myself					

Thank-you, for completing the above questionnaire.

36-Item Health Survey was developed by Rand as part of the medical outcomes study

Appendix D:**Biochemical and clinical assessment****QUALITY OF LIFE OF CHRONIC DIALYSIS PATIENTS**

Date	
Blood pressure	
Weight (pre)	
Weight (post)	
Weight gain	
S – Sodium	
S – Potassium	
S – Chloride	
S - CO ₂	
S – Urea	
S – Creatinine	
S – Magnesium	
S – Phosphate	
S – Albumin	
S - Calcium (total)	
Cholesterol	
S – Iron	
S – Transferrin	
S – Ferritin	
% Saturation	
Hemoglobin	
Hematocrit	
Parathyroid hormone	
Kt/V	

Any co-morbid conditions?

Appendix E:**Questionnaire: Nephrology practitioner****QUALITY OF LIFE OF CHRONIC DIALYSIS PATIENTS**

Researcher: Chevon Clark
 Contact number: 076 714 3300

NAME: _____
 Doctors / Nurses / Clinical technologists

1. Do you feel the majority of patients commence chronic dialysis after being through:

An acute program¹ or a pre-end stage kidney disease program²
 or neither³

	Yes ¹	No ²
2. Do you feel enough awareness is being created about end stage kidney disease?		
3. Do you feel quality of life is an important factor to consider?		
4. Do you feel that the majority of health care professionals consider their patients quality of life, when treating kidney failure patients?		
5. Do you feel that the majority of health care professionals provide sufficient support to patients to cope with their kidney failure?		
6. Do you think that nephrology professionals should discuss a non-dialysis pathway with appropriate patients who have end stage kidney disease e.g. elderly, advanced HIV?		
7. Did you discuss a non-dialysis pathway with your patients?		

8. How do you think most kidney failure patients rate their overall health?

Excellent¹ Very good² Good³ Fair⁴ Poor⁵

9. Do you feel that the majority of kidney failure patients expect their health to get worse?

Yes¹ No²

10. How do you think most kidney failure patients feel about their:

	Very dissatisfied 1	Mildly dissatisfied ²	Mildly satisfied ³	Very satisfied ⁴
10.1 Personal appearance				
10.2 Health				
10.3 Lifestyle				
10.4 Dialysis				

11. Please rate the following challenges affecting kidney failure patients with the effect you think they have on the kidney failure patients from 1 to 5, with 5 being the largest effect and 1 having no effect.

	No effect 1	Minor effect 2	Moderate effect ³	Major effect 4	Very large effect ⁵
11.1 Time on dialysis					
11.2 Activities (exercise, walking, sports)					
11.3 Being employed					
11.4 Maintaining employment					
11.5 Financial					
11.6 Been fluid restricted					
11.7 Having dietary restrictions					
11.8 Being dependent on others					
11.9 The effect kidney failure has on the patients family					
11.10 Spending time with family and friends					

12. On a scale of 1 to 10, how difficult do you think it is for a person to live with kidney failure, with 10 being the most difficult?

1 2 3 4 5 6 7 8 9 10

13. From an educational perspective do you feel the majority of kidney failure patients are knowledgeable on:

	Yes ¹	No ²
13.1 Dietary restrictions		
13.2 Fluid restriction		
13.3 Anemia		
13.4 Bone disease		
13.5 Dialysis adequacy		
13.6 Cardiovascular management		
13.7 Taking care of their access		
13.8 Prescribed medication and their mode of action		
13.9 Kidney failure complications and the management thereof		