The Psychological Profiling Of Hemodialysis Patients and its Parallel with Physiological Indicators in Hemodialysis

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Preface

The current model of mental health has increased focus biopsychosocial model if mental health. The concept of the biopsychosocial model highlights the biological, the psychological and social feedback loop that determines ones mental status. The past decade has seen the increase of chronic illness, and the advancement of treatment for the same. The state of chronic illness involves a regimen that dictates lifelong treatment till palliative care or death. The maintenance and the sustenance of the individuals through the course of treatment and settlement in to routine life with the illness vary based on the diagnosed illness. Chronic illness in any medical proviso is known to result in any form of psychological problem, most commonly depression as a result of change in one's life style. An attempt to address this psychological problem has been a new venture in the field of psychology. The present study is on chronic illness involving Chronic Kidney Disease (CKD). CKD is when an individual's kidney fails and the long term effect of the failure is death. There are two interventional protocols for CKD the first is dialysis and the other Kidney transplant. Both treatment protocols are effective, though transplants are not easy intervention protocols that are easily available. Large number of patients undergoing dialysis, dialysis is of two type's peritoneal dialysis (PD) and Hemodialysis (HD). Hemodialysis is the most common protocol for treatment in India. The process of dialysis intervention is effective based on how the patients go through and maintains on the intervention and these impacts the life span of the patients. This related to addressing the psychological factors of hemodialysis patients as per our biopsychosocial model. The present study aims to identify if there is a relationship between key physiological variable that evaluates the health status of HD patients such as serum albumin, creatinine, inter-dialytic weight gain (IWG) and physical status to identify if they correlate with key psychological variables such as depression, anxiety, illness intrusiveness, quality of life-physical (QOL-P) and quality of life-health (QOL-H) that come with the life style changes in HD patients. This association factor can be help understand and improve dialysis outcome for the patient and also add on the existing treatment protocol especially in the Indian setup.

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ACKNOWLEDGEMENT

..... The journey was a blur but the purpose was far and real, there is no path that can be unfolded when the need arises to find the place of outmost satisfaction.....

This document of study was started on one such blind journey that knew only the final goal as to reach the distend point to a lank mark for further journeys to come. The journey was short, but the time was filled with moments that will stay in our hearts forever more. Yes, the journey is complete for now.....

First and foremost, I owe my heart fill gratitude to the God Almighty, for is grace and guidance in successfully completing my work. I take this opportunity to thank my guide Dr. Subramaniam S , Professor and Head, Department of Psychology, Bharathiar University for his constant support, guidance, assistance and above all his unfailing encouragement for the completion of the study. I would also take the opportunity to extend my gratitude to the patient who had participated in the study they had lend an opening to a may be new approach by which they and their contemporaries can benefit from.

I would also like to extend my thanks to my friends and colleagues for their moral support and helping hand. Last but not least a part that has always been there always my side in whatever endower I have embarked on, their constant encouragement and blessing has been always by my side no matter the distance, My Mom and Dad.... God you guys have been so patient with me .. then again its all you …….it goes without words for their love has brought me to this platform of life.

And Never Forget GOD ALMIGHTY for his un failing Love, Guidance and Support that has never failed me …… !!!

Author

Dr. Emilda Judith Ezhil Rajan educated at Avinashilingam University for Women (AU) 2003 – 2006 where she studied B.Sc. in Interior designing and Psychology, M.Sc. Applied Psychology at Bharathiar University (BU), Coimbatore 2006-2008 and continued her education at Sri Ramachandra University (SRU), Chennai 2008-2010 in M.Phil. Clinical Psychology, she also has a Diploma in Cognitive Behaviour Therapy, UK. 2011-2012, further in July 2016 she has completed her PhD in Clinical Psychology working with dialysis patients at Bharathiar University Coimbatore.

At present she is working in the department of clinical psychology as a lecturer cum consultant clinical psychologist at Sri Ramachandra University Chennai. Her clinical role in chronic medical conditions and coping strategies are wide. She works pre and post-transplant patients. Her clinical role in chronic medical conditions and coping strategies are wide. Her Psychological training is primarily in behaviour therapy and largely involved in diagnostics and intervention in the areas of Paediatrics Psychiatry, Neurology, Nephrology, Cardiology and Community Health. Her additional interventional training includes; EMDR Level 1, Neuro Rehabilitation, Hypnosis, Behavioural Analysis, Psycho-physiology, Stress Management. She has published papers and presented in workshops, Seminars & conferences of the above mentioned areas.

And she is practicing her profession with “Clinical Psychologist Licensed under the Rehabilitation council of India (RCI) since 2011 and renewed in 2016.”

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CHAPTER 1 INTRODUCTION

Stress is a concomitant of chronic illness and its treatment and it is exhibited to have a meaningful influence on psychological and medical outcome. Studies have suggested that there were several responses of excessive wear and tear in the human physiology. It starts with a response pattern with excessive and repeated insult over time, a pattern where the organism is unable to habituate to stressful stimulus pattern that is activated, when it remains at a heightened level of activation without sufficient recovery to baseline status, following which the primary mechanism fails and a compensatory mechanism is activated. The above mentioned pattern will lead to various end-organ responses that may be characterized in patients with chronic illness (Cukor et al 2007).

The concept of chronic illness and its subsequent mental health challenges are posing major concern in society today. The concept of adaptation to chronic illness and its treatment process is considered as a multi-dimensional process that includes biological, psychological and social dimensions and their inter-relationship (Hardy, 1991). Affective disorder of anxiety and depression are established to be the most commonly occurring psychological disorder in medical illness (Dimatteo et al., 2000). Due to this the psychosocial aspects are being considered as an integrated part of the treatment process for the chronic medical conditions. Over the years the idea of incorporating some of the key psychology factors play a vital role in providing integrated health care to patients and the idea of WHO's definition of health considering the Physical, Social and Mental Health as a combined concept in defining an individual health status is gaining much importance.

1.1 End Stage Renal Disease (ESRD) as a Platform for Psychological Research

The concept of "Psychoneprology" has been a subject of research for many years and recent studies have advanced our understanding of the interaction of psychological factors with medical outcome as discussed by Cukor (2009). In recent times much of the attention has been paid to understand the individual characteristics of those patients who are getting treatment of dialysis for End Stage Renal Disease (ESRD) relating to social situation, perception and response to illness, their physician and healthcare providers, their spouses and families (Cukor et al 2009).

Depression affects the medical outcome of ESRD patients through the modification of their immunologic and stress responses, impact on nutritional status and medical regimen (Curkor et al., 2007). Among the stressors that have been commonly identified, the key stressors are constant threat of death and the potential for reduced life expectancy, dependence on medical machinery and personnel, decreased physical strength and stamina. Factors like strict diet specific to dialysis patients, dialysis timings, the process of dialysis, complex medical regimen, change in life style etc. have a great impact psycho-social well-being of dialysis patients. Implicit among the stressors is the construct of illness intrusiveness; the extent to which an illness or its treatment may interfere with the facets of a person's life (Hardy, 1991).

Quality of Life (QOL) has been increasingly viewed as a useful measure of the treatment outcome of patients with ESRD, which is influenced by the disease and by the type of replacement therapy (Kosmadakis, 2010). ESRD patients have a high burden of disease affecting their Quality of Life (QOL) and thus shortening their life expectancy (Paasikivi, 2011).One of the most common misconceptions is that ESRD patients are viewed as too ill to perform any physical activity, lack motivation to do any work and also they are being perceived as a health risk (Painter et al., 2004). Physical exercise has greatly benefited ESRD patients by showing significant improvement in their level of depression, quality of life, physical and mental health and also known to reduce anxiety symptoms (Kosmadakis, 2010).

1.2 The Unique aspects of Psychological effects relating to Physiological aspects of ESRD

Physiological aspects of ESFRD play a major role that determine by the measurement of specific biochemical component in the blood. Creatinine is one of the primary indicators of renal functioning. Creatinine clearance is the determinant of reduced renal functioning. Hence doctors rely on those results that indicate creatinine and urea level in the blood and the composition of their diet. Also, high creatinine indicates the reduction of muscle mass due to renal failure (Henderson & Thuma, 2007). Research studies indicated that low serum albumin (SA) levels are reliable predictors of mortality. Two such factors are depression and physical activity among dialysis patients.

Depression has been noted to cause reduced serum albumin levels of dialysis patients (Zamojska et al., 2006). The advice on the restriction of fluid intake is the cornerstone of management of patients with kidney failure. Knowledge about diet and complications of noncompliance with the fluid restriction was seen as non-

significant factor in dialysis care and therefore doesn't bring in compliance among the patients (Durose et al., 2004). Inter-dialytic Weight Gain (IWG) is also associated with the survival of ESRD patients, increased IWG is found to reduce the life expectancy of dialysis patients (Kimmel et al., 2000 b). Studies have shown that IWG is related to an individual's perception of the barrier to treatment and treatment adherence, self-efficacy and their adherence and perceived health risk (Ghaddar, Shamseddeen &Elzein 2009)

1.3 Relevance of psychological research in specific to Hemodialysis HD

Over the past few decades' large number of studies centred on Quality of Life among dialysis patients in combination with studies that highlighting the aspects of depression, anxiety and IWG. Quality of life has been considered as the major indicator proof psychological health in ESRD patients as it measures corresponding changes they go through in their physical, social and psychological functioning which can be attributed to both the disease process and patient's ability to adapt to the changes (Tallis 2005). Hemodialysis is considered as one of the most common methods of renal replacement therapy for end stage renal dialysis (Sakhuja & Kohli 2006). The procedure of hemodialysis treatment, besides objective organic difficulties, is major causes for changes in psychological status and personality of patients. This occurs due to the result of continuous stressful situation that arise out of having the dialysis sessions three or two times a week. The other factor that majorly affects the patient undergoing hemodialysis is the drastic change in their lifestyle; loss of job, social position, dietary regimen, sexual dysfunction, problems related dialysis, and anxiety related to mortality (Kimmal & Levy 2000). Depression has also the most common and probably the most important psychopathology complication of hemodialysis. While the hemodialysis is effective in controlling uraemia, daily impact of dialysis and increased treatment related stress may worsen the burden of treatment and lead to depression (Chilcot et al 2008).

1.4 Kidney Disease and its Reach

Kidney is the primary excretory organ of the human body (Reddy 2013).One of the major role of kidney is to maintain homeostasis by the excretion of urine. During the formation of urine,the kidney is known to regulate various activities in the body that play a role in maintaining homeostasis. Functions that aid in homoeostasis are; excretion of waste products formed by metabolic activities like urea, uric acid, creatinine, bilirubin and other products of metabolism. Kidney is also known to maintain water and electrolyte balance along with maintaining acid base balance of the body (Sembulingum & Sembulingum 2013).

The kidney also has a number of non-excretory functions; such as Regulation of blood electrolytes, Regulation of blood pH, Regulation of Blood volume, Regulation of Blood pressure, Maintains blood osmosis, Regulates blood glucose level and detoxification of certain substances. Kidney also produces hormones such as calcitriol, erithropoitein, renin, bradykinin and prostaglandin (Reddy 2013).Of the above mentioned, the extremely important function of the kidney is the regulation of the Acid Base (pH), water and electrolyte balance (Bijlani & Manjunatha 2011).

The pH of the body fluid is maintained in a very narrow range. Regulating the acid –base balance is a remarkable task of the body as normal metabolism poses a constant threat to maintain the balance. The pH is maintained in the narrow range as a result of a three-tier defence. Firstly, any addition of acids is immediately buffered by physiological buffers such as bi carbonate buffer, protein buffer and phosphate buffer. Secondly, any moderate disturbance in acid-base balances corrected within minutes by adjustment of pulmonary ventilation. Respiration has a direct bearing on acid base balance of the body because carbon dioxide (CO_2) is eliminated from the body during expiration. CO_2 is acidic in nature hence increased respiration reduces acidity of the body. Respiration has a twofold relationship with the acid-base balance of the body; on one hand change in pH of the body fluid influences respiration and on the other hand change in respiration affects the pH of the body (Bijlani & Manjunatha 2011). Diseases of the kidney are among the most important causes of death and disability in many countries throughout the world. Severe kidney disease can be divided into two main categories: Acute Renal Failure and Chronic Renal Failure (Hall 2011).

Acute Renal Failure (ARF)-Acute Renal Failure results when there is a sudden and sever reduction in glomerular filtration rate and kidney functions that is reversible over days or weeks if treated. The Causes of acute renal failure are classified as:

- Prerenal- the result of reduced renal blood flow, especially as a consequence of severe and prolonged shock.
- Renal- occurs due to the damage of the kidney itself due to, acute tubular necrosis, glomerulonephritis
- Post renal- arises from the obstruction to the out flow of urine, eg: disease of the prostate gland, tumour of the bladder, uterus or cervix, large stone in the renal pelvis (Waugh & Grant 2010).

Chronic Renal Failure (CRF)-Chronic renal failure is a progressive, long standing and irreversible impairment of renal functions. When some of the nephrons lose their functions, the unaffected nephrons can compensate for it. As more and more nephron start to lose their functions over months or years, the compensatory mechanism fails and chronic renal failure develops. The causes of CRF are chronic nephritis, polycystic kidney disease, renal calculi, urethral construction, hypertension, arteriosclerosis, tuberculosis and slow poisoning by drug or metals (Sembulingum & Sembulingum 2013).

Chronic renal failure results when the renal reserve is lost and there is a loss up to 75% of nephrons. The onset is a slow process that is asymptomatic, progressive over several years. The main causes are diabetes mellitus, glomerulonephritis and hypertension. The effect of glomerular filtrate rate (GRF), selective reabsorption and tubular secretion are significant. The GRF and filtrate volume greatly reduces water absorption and this can lead to producing over 10 litres of urine per day. This in turn leads to accumulation of waste substances in the blood notably urea and creatinine. When renal failure occurs blood urea arises leading to uremia (Waugh & Grant 2010).

1.4.1 End Stage Renal Disease (ESRD)

Vicious cycle of chronic renal failure leads to End Stage Renal Disease (Fig .1). In most cases an initial insult to the kidney leads to progressive deterioration of the kidney function and further loss of nephrons to the point where the person must be placed on dialysis treatment or transplanted with functional kidney to survive, its referred to as End Stage Renal Disease (Hall 2011).

When death is likely without renal placement therapy such as haemodialysis, peritoneal dialysis or a kidney transplant the condition is referred to as End Stage Renal Failure. The excretory function of the kidney is lost. Acid base balance cannot be maintained and the endocrine functions of the kidneys are lost. Towards the end of life anorexia, nausea and very deep respiration occurs as uraemia progresses. In the final stage there may be hiccoughs, itching, vomiting, muscle twitching, seizures, drowsiness and coma (Waugh & Grant 2010).

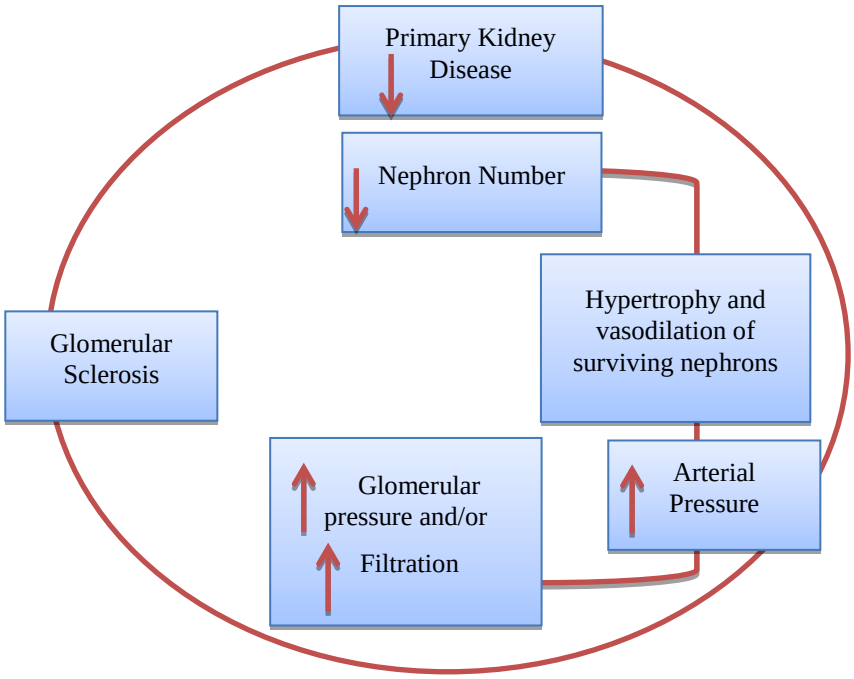


Figure 1: Vicious Cycle of Chronic Kidney Disease *(Illustrate from Guyton and Hall Text bookof Medical Physiology 12th edition, Hall 2011)*

1.4.2 Renal Replacement Therapy

When kidney fails to function, instruments are used to clear the accumulation of metabolic products. This process is carried out by artificial kidneys; this process is called dialysis and it is done when renal failure results in Uraemia(Reddy 2013). The principle process behind the function of artificial kidney is, arterial blood is passed through minute channels bounded by a thin membrane and on the other side of the dialysis fluid is passed. The metabolic products diffuse from the blood into the dialysing fluid. Mostly K^+, HPO^-_4, sulphate, uric

acid, creatinine and urea accumulating in the uraemic plasma and gets diffused in to the dialysing fluid during dialysis(Reddy 2013)

The mechanism behind the process involves a membrane made up of cellophane which is permeable to all substances except colloids. The amount of substance that is transferred depends on; the difference in the concentration of substances between the two fluids, molecular size and the duration and the time the fluid is in contact with the membrane. The arterial blood is allowed to pass on one side of the membrane and dialysis fluid in the other just before passing in to the unit Heparin is injected to prevent clotting and when it is returned protamine is added to neutralize the heparin. The defusing continues till the arterial level of metabolic products reach a near normal level. This process is repeated frequently based on the need (Reddy 2013).

Individuals with end stage renal disease are treated with the use of artificial kidney; two treatment processes that involve the process of artificial kidney and used in the medical treatment process are Hemodialysis and Peritoneal Dialysis. Timely and effective preparation for RRT as well as assiduous management of the complications of CKD is crucial. There are certain overriding medical or social imperatives, the choice between peritoneal dialysis and hemodialysis should be free and not constrained by clinical prejudice or resource issues. Sufficient time and information must be provided to allow patients and families to make this choice. The access to dialysis, dietary restriction and treatment of anaemia are also important factors that are to be considered in preparing for renal replacement (Goldsmith & Jeyawardan 2013).

1.4.3 Hemodialysis

In Hemodialysis the blood from the patient is pumped through an array of semipermeable membrane which brings the blood into close contact with dialysate, flowing concurrent to the blood. The plasma biochemistry changes towards that of the dialysate owing to diffusion of molecules down their concentration gradients as in an artificial kidney. Dialysis must be tailored to an individual to obtain optimal results; these factors involve the initiation of dialysis, dry weight of the patient, maintain the level of concentration of the dialysis buffer and more importantly the frequency of the dialysis for the patient (Kumar & Clark 2012).

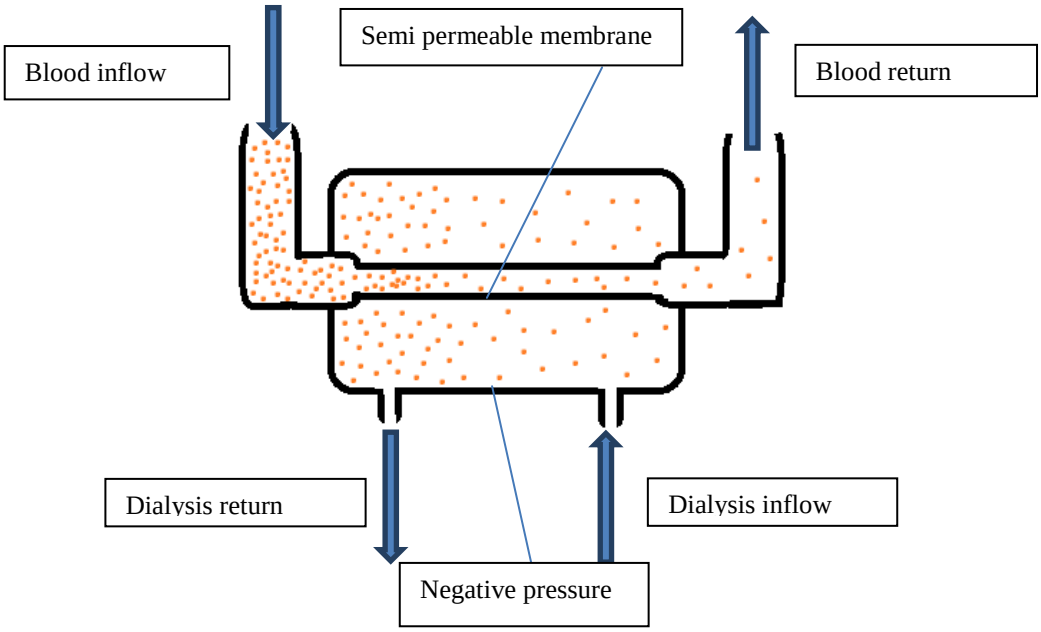


Figure 2: Change across a semipermeable membrane Hemodialysis *(Illustrate extracted from Kumar and Clark's clinical medicine 8th edition 2012)*

The adequacy of dialysis treatment is empirical since the size, number and nature of the uraemic toxin is unclear. The only true measure of adequacy is patient mortality and morbidity. Adequate nutrition of the patient as well as adequate dialysis is necessary to reduce morbidity and mortality. Symptoms of under-dialysis are nonspecific and include insomnia, itching and fatigue, restless legs and peripheral sensory neuropathy. Hemodialysis is the most efficient way of achieving rapid biochemical improvement, for instance in the treatment of acute kidney injury or sever hyperkalaemia. This advantage is offset by advantage of

haemodynamic instability especially in acutely ill patients with multi organ disease and the over rapid correction of uraemia can lead to dialysis disequilibrium (Kumar & Clark 2012).

1.5 The Backdrop of Psychological Factors in ESRD and HD

The complication of dialysis depends on the patient's condition, age, existence of the diseases other than renal failure and many other factors. Common complications for individuals undergoing dialysis with renal complications only are; sleep disorder, anxiety and depression (Senbulingum &Senbulingum 2013).

Adaptation to chronic illness and its treatment can be conceptualized as a multi-dimensional process that includes biological psychological and social dimension and their interrelationship (Hardy 1991)

Many people with kidney disease may find it hard to give up their unhealthy habits that may be harm full to their health. As there is an increased need for change in life style, this change can only be brought out by motivation on behalf of the people. This is very much in tune with behaviour change. Behaviour change is depends on the individual s level of motivation which calls for the stage s of change, as illustrated below (Robert Scales 2005).

It is important for the health care provider to identify the stages in which the client is having difficulty in overcoming currently in order to predict and process behaviour change for the betterment in adherence to treatment, compliance and life style change (Robert Scales 2005).

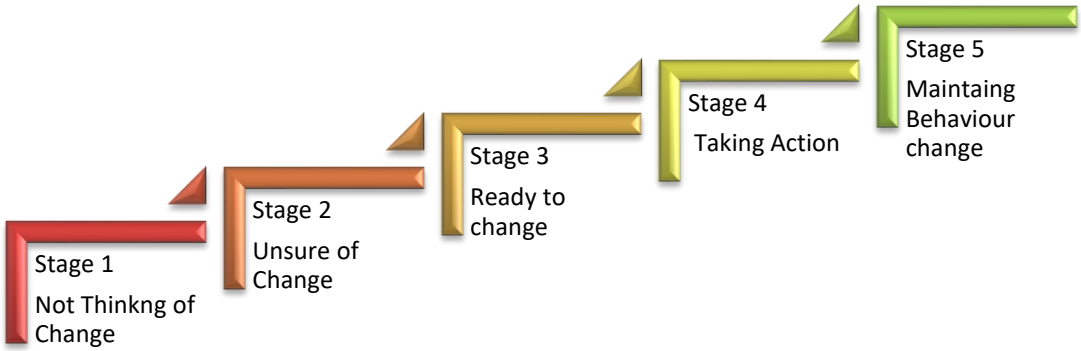


Figure 3 : Stages of Motivation *(Illustrate from Family focus mental health , tips to cope with Chronic Kidney disease, Robert Scales 2005)*

Dialysis maintains life, but patients face life-long physical, psychological and social problems relating to their illness and treatment, as dialysis can only replace only part but not all of the renal functions. Anxiety, depression, fear, emotional fluctuation and various psychological stressors are common among ESRD patients. Psychological adaptation and social adjustment are important challenges to renal patients on dialysis therapy (Tallis 2005).

1.5.1 Depression and Anxiety

Affective disorder of anxiety and depression are the primary psychiatric problem of end stage renal disease patients. Depression and anxiety symptoms has been gaining increasing attention as authoritative measure of psychopathology in ESRD population (Patel et al 2012).Though it has been seen that compared to depression, anxiety has received little clinical attention, though it was noted to be prevalent in End Stage Renal Dialysis (ESRD) population. Depression affects the medical outcome of ESRD patients through modification of immunologic and stress responses, impact on nutritional status or access to prescribed dialysis and medical regimen, this is illustrated below (Curkor 2007).

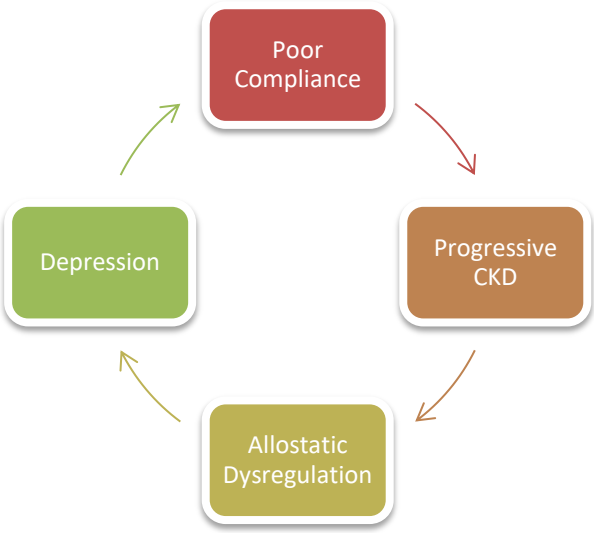


Figure 4 :Potential mechanism of the vicious cycle of depression and CKD *(Illustrate from Psychosocial aspect of chronic disease: ESRD as a paradigmatic illness, Curkor et al 2997)*

Among ESRD patients' depression has been established as a primary mental health issue (Kimmal & Peterson 2006). Several studies have shown that there was a significant association between depression and mortality (Kimmel et al 2000 a). Resent findings have shown the use of pharmacotherapy as well as nondrug therapy for depression and also that anxiety is prevalent among ESRD patients (Cukor et al 2007). It has also been noted as an indirect effect, particularly in relation to behavioral phenomena mediating the relationship between anxiety and depression and also the other adverse out comes (Lin et al 1995). Depression has also known to alter the outcome of medical treatment in ESRD patients stating with compliance to treatment, altered immune system, increases cytokine level and poor nutrition (Cohen et al 2007).

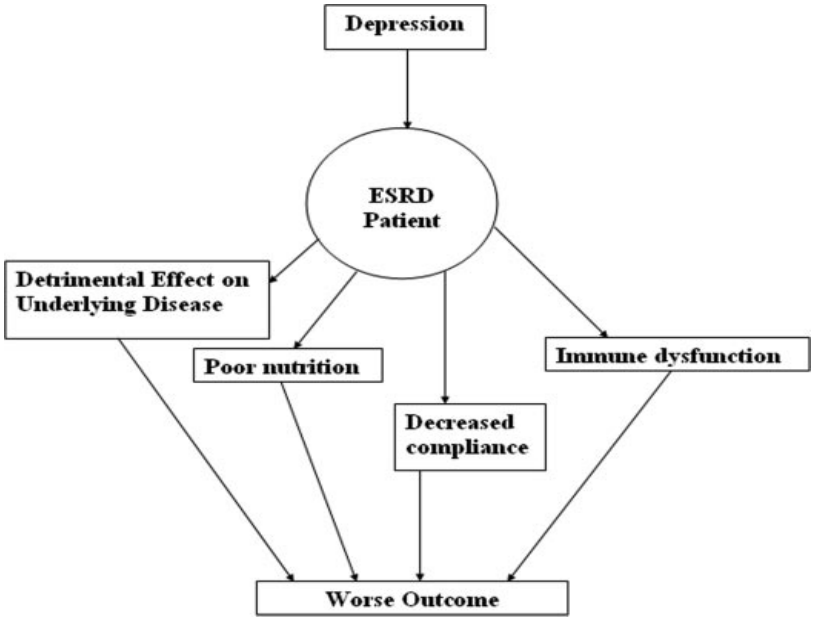


Figure 5 : Depression and its effect on medical outcomes. Depression has the potential to modify medical outcomes through a number of mechanisms, including its effect on the underlying disease process, poor nutritional status, decreased compliance with medications/physician's prescriptions, and immunologic dysfunction. (*Adapted from Cohen et al (2007) Screening, diagnosis, and treatment of depression in patients with end-stage renal disease. Clinical Journal of the American Society of Nephrology)*

Anxiety is a common psychological response in chronic illness. In previous studies, approximately 50% of the respondents indicated borderline or clinically significant signs of anxiety and depression in dialysis patients (Killingworth & Akker 1996). Individuals with high levels of self-care are better able to manage their ESRD. Self-care has been influenced by psychosocial factors such as anxiety, depression, life events, stressors, and social support. Most studies cited that people with hemodialysis have examined these psychosocial factors

independently (Mollaog˘lu 2004). The results of those studies showed that there was adequate social support, anxiety, and self-care ability among patients undergoing hemodialysis. It is reasonable to assume that social support and anxiety contribute to self-care in dialysis patients. In this way, psychological distress could be decreased, social support increased, and self-care ability improved (Mollaog˘lu 2006).

1.5.2 Illness intrusiveness

Among the stressors that have been commonly identified is the constant threat of death and the potential for reduced life expectancy, dependence on medical machinery and personal, also decreased physical strength and stamina. Factors like stringent die, dialysis timings, the process of dialysis, complex medical regimen, change in life style, etc. have a great impact. Implicit among the stressors is the construct of illness intrusiveness; it is the extent to which an illness or its treatment may interferes with the impairment facets of a person's life. These disruptions can be direct intrusiveness, indirect intrusiveness or secondary consequence.

Direct intrusiveness is introduced by the physiological effect of irreversible renal failure such as reduced physical strength, stamina or increased uremic symptoms. When often augmented with non-renal problems and when elements of treatment regimen come into conflict with lifestyle, the routine activity pattern may be disrupted.

Indirect intrusiveness interference in the family relationship and friendship patterns are disrupted and affected. The perception of a person held by the family may change dramatically. There is a shift in the family role as the individual's autonomy and independence are eroded significantly and thus the frequency of family, social and leisure activities may be disrupted.

Secondary Consequences is the decreased involvement of valued activities which may introduce additional disruptions or loss. This can lead to even further withdrawal from daily involvement. A naturally occurring continuum of intrusiveness was identified by ranking the various treatments in terms of (a) the degree to which the schedule of delivery requires that patients relinquish or reschedule valued activities; (b) the amount of time involved; and (c) the stringency of associated dietary and fluid intake limitation.

Dialysis of any kind appears to be more intrusive than is successful renal transplantation. In addition to the treatment modality, a number of other illness related factors have been identified that contributed to the perceived intrusiveness of ESRD. These are elevated uremic symptoms; intercurrent non renal illness; difficulties in performing daily activities; increased time requirements and illness-related concerns (Hardy 1991).

1.5.3 Quality of life in End Stage Renal Disease

The World Health Organization defines Quality of Life (QOL) as "an individual's perception of their position in life in the context of culture and value system where they live and in relation to their goals, expectations, standards and concern" (Skevington, Lofty & Connell 2005).In similar terms QOL is said to encompass physical, psychological and social functioning and is determined by how well the patients perceptions correlate to their expectations of functional status and subsequent QOL (Tallis 2005). It is well known that patients with a good QOL at the start of treatment fare better than those with a poorer baseline score, but there is also an increasing body of literature in various cancers demonstrating the utility of QOL as an effective prognostic indicator. Assessment of QOL has been shown to provide a better estimate of survival (Folloefield 2009).

QOL has been increasingly viewed as a useful measure of the outcome of treatment. QOL of patients with ESRD is influenced by the disease itself and by the type of replacement therapy (Davison et al 2008). ESRD patients have a high burden of disease affecting their QOL and dramatically shortening their life expectancy. Therefore exploring their QOL becomes a prime importance so as to provide effective ways of managing this population. They are facing with serious stressors relating to their illness and the chronic nature of the disease and the illness intrusiveness of the medical treatment. They are often confronted with limitations and physical symptoms, with psychological stressors such as loss of self-concept and self-esteem, feeling of guilt towards family members, and problems in social domain (Paasikivi 2011).

1.6 The Backdrop of Physiological Factors in ESRD and HD

End stage renal disease either acute or chronic had adverse biological effect on almost all organ systems;

- Neurological and neurobehavioral disorders involve peripheral neuropathy, acute and chronic mental disorders and cognitive performance deficit
- Electrophysiological Abnormalities

- Both diabetic and non-diabetic chronic hemodialysis patients have impairment in physical capacity that interferes with both personal and vocational functioning
- High level of psychological and psychiatric syndromes are documented in hemodialysis patients
- Hemodialysis individuals also have an increased degree of impairment in social functioning, family relationship problems, marital conflicts, sexual dysfunction and psychological distress in children of adult hemodialysis patients (Hardy 1991)

1.6.1 Creatinine

Creatinine is derived from creatine phosphate which in turn is formed from creatine. Creatine constitutes about 0.5% of the total Muscle weight. It is synthesised from 3 amino acids, glycine, arginine and methionine. This process involves four steps:

- The first reaction is the amidino group of arginine is transferred to glycine to form guanidoacetic acid, cartelized by amido transferase this happens in the mitochondria of the kidney.
- The second step is where the guanidoacetic acid is methylated by S- adenosyl methionine by methyl transferase to form creatine; this takes place in the liver.
- The third step is where the creatine is transferred to creatine phosphate. The storage of creatine phosphate is done the muscles and this serves as immediate energy in the muscles, when ATP (Adenosine triphosphate) hydrolysis takes place.
- The Fourth step is the formation of creatinine; it happens when the creatinine phosphate may convert to its anhydride form that is creatinine.

The formation of creatinine is a no enzymatic spontaneous process. Creatinine is excreted in the urine. The blood level of creatinine and creatinine and the urinary excretion of creatinine are constant, as long as the muscle mass is not affected. The normal creatinine level is 0.7 to 1.4 mg/dL (Vaudevan, Sreekumari & Vaidyanathan 2013). Creatinine is one of the primary indicators of renal functioning, Creatinine clearance is the determinant of reduced renal functioning hence doctors rely on the results that indicate creatinine and urea level in the blood and the composition of the diet, and creatinine also indicates the reduction of muscle mass due renal failure. Creatinine combine with the Glomerular filtration Rate and the Urea level of the body can be a safe indictor to predict the decline in renal functions (Henderson & Thuma 2007).

1.6.2 Serum Albumin level

Proteins circulate throughout in the blood circulation system to help the body to maintain fluid balance. Albumin is produced in the liver, and is one of the most abundant proteins in our blood's fluid or plasma. A proper balance of albumin is required to keep fluid from leaking out of blood vessels. Albumin also carries vital nutrients, hormones, and proteins required to clot blood properly. If individuals liver and/or kidneys are not working well, serum albumins won't be at their normal levels. With a simple blood test, the doctors can find out patients albumin levels and interpret accordingly the status of one's health based on the albumins levels in the body (Hall 2011).

Testing the albumin level in the blood can help determine if a patient has liver disease or kidney disease, or if the body is not absorbing enough protein. Albumin helps move many small molecules through the blood, including bilirubin, calcium, progesterone, and medications. It plays an important role in keeping the fluid from the blood from leaking out into the tissues. The normal range is 3.4 - 5.4 grams per deciliter (g/dL). Abnormal range can be either lower than normal or increased blood albumin. Lower-than-normal levels of serum albumin may be a sign of Kidney diseases or Liver disease (for example, hepatitis, or cirrhosis that make cause ascites) Decreased blood albumin levels may occur when the body does not get or absorb enough nutrients, such as: After weight-loss surgery, Crohn's disease, Low-protein diets, Sprue and Whipple's disease. Increased blood albumin level may be due to: Dehydration, High protein diet, having a tourniquet on for a long time when giving a blood sample (Berk & Korenbalt 2011, Pratt 2010).

Serum albumin levels have been used extensively to assess the nutritional status of individuals with and without (CRF) chronic renal failure (Blumenkrantz et al, 1980). Malnutrition is common in the ESRD population (Ahmed & Kopple 1998), and hypoalbuminemia is highly predictive of future mortality risk when present at the time of initiation of chronic dialysis as well as during the course of maintenance dialysis (Lowrie, Huang & Lew 1995). It follows that nutritional interventions that maintain or increase serum albumin concentrations may be associated with improved long-term survival, although this has not been proven in randomized, prospective clinical trials. Serum albumin levels may fall modestly with a sustained decrease in dietary protein and energy intake and may rise with increased protein or energy intake (Keys et al 1950). Research studies suggested that serum albumin is independently affected by both inflammation and nutritional

intake (Friend, Hatchett, Wadhwa & Suh, 1997). Further, research has indicated that low serum albumin level is reliable predictors of mortality. The two psychological factors such as depression and physical activity are significantly related to regulation of the serum albumin level in the physiological system among dialysis patients. Depression has been noted to cause reduction of serum albumin level in dialysis patient and similarly physical activity has been highly correlated with hemodialysis patients (Zamojska 2006)

1.6.3 Interdialytic Weight Gain (IWG)

Advice on the restriction of fluid intake is a cornerstone of management of patients with kidney failure. Doctors prescribe fluid restriction on ward round for patients with acute renal failure. Nurses on the dialysis unit, backed up by dieticians and psychologist, exhort patients to drink less, telling those with large Intradialytic weight gains that they are putting themselves at risk of heart failure and death. Written information for patient invariably emphasizes the importance of fluid restriction, as do textbook of renal medicine and dialysis. Without doubt that fluid intake is the most important determinant of weight gain between one session of haemodialysis and the next, particularly in patients with minimal residual urine output. Small amount of water can be lost in the form of sweat but these losses generally amount to not much more than 500ml per day in the cool climate (Thomson 2001).

Knowledge about the diet and complications of noncompliance for the fluid restriction was seen to a non-predictor and doesn't bring in compliance for the patients (Durose et al 2004). Compliance to fluid overload and other dietary recommendation is essential to survive for Hemodialysis patients. The education aspect should focus on compliance to health outcome, with the therapeutic goal of optimizing patient care, improving quality of life and in minimizing complications, rather than merely placing emphasis on adherence to recommended diet. Thus a better understanding of patient's belief and their level of self-efficacy is the key to attain compliance and achieving required behavioural modification (Ghaddar, Holdsworth & Watson 2009). Increased IWG was associated with the survival of ESRD patients and compliance to the dietary regimen and IWG is associated with outcome such as survival. IWG is also listed to worsen other complications such as hypertension, cardiovascular stress and incident diabetic in Hemodialysis patients (Kimmel et al 2000 b).

1.6.4 Physical Performance

One of the most common misconceptions of the ESRD patients is that they are viewed as too ill to perform any physical activity and also lack motivation to do so, and more importantly perceived as an health risk (Painter et al 2004). Implementing physical actively as part of the treatment regimen for ESRD patient have indicated that physical activity improves physical functioning and psychological status and their quality of life. Reduced exercise capacity has often been reported as an obstacle in ESRD patients, which can be overcome with appropriate exercise programs. Pioneer studies have shown that higher levels of physical activity improve cardiovascular risk, physical function, psychological status and health-related quality of life. Despite the overwhelming reported benefits, the implementation of exercise programs is not commonly advocated in most countries (Wang, Chan & Lim 2011). Physical exercise has greatly benefited ESRD patients by showing significant improvement in their level of depression, quality of life, physical and mental health and also known to improve anxiety symptoms (Kosmadakis et al 2010).

1.6.5 Prevalence of ESRD in India

Udayakumar (2006) claimed that the chronic kidney disease is considered as silent epidemic in developing countries and particular in pertinence to the Indian scenario. He stressed that the major reason is the lack of affordability and the epidemic of chronic renal failure is an overt diseases tipping of the beginning of a covert disease. Providing renal replacement therapy is a major concern.

The benefits of renal replacement therapy are firmly established. In the advanced countries, it is offered uniformly to all patients who need it; the availability is still limited in the developing world. Nissenson & Fine (2004) drew attention to the strong influence of non-medical, especially economic, factors on the quality and quantity of ESRD care.

The economic, human and technical resources required for ESRD treatment pose major economic and political challenges. India is divided into 35 administrative units called the state and union territories. The union government decides board policies, but each state finalizes its own healthcare priorities and budgeting. The public sector health care is organized in the shape of a pyramid, with primary health centres at the bottom, followed by blocks and district level hospital and referral hospitals at the top (Nahas et al 2005).

The inability of the states to provide adequate health care has lead up proliferation of the "for-profit" private hospital. There are enormous verities in the quality of service provided by these hospitals but in general

larger cooperate hospitals provide better comfort levels to the patient and many advertise international standards. The treatment costs are often quite high and only the wealthy or by those whose health care expenses are covered by their employers can afford treatment. Hospitals run by charitable organization offer treatment at subsidized costs (Nahas et al 2005)

In the past glomerulonephritis was reported to be the most common cause of ESRD in India. This was associated with higher prevalence of bacterial and viral infection though currently the etiology has changed as indicated below; (Toal et al 2011).

Cause of ESRD	INDIA (%) (N= 35,697)
Diabetic nephrology	31.2
Hypertension	14.1
Chronic glomerulonephritis	14.4
Chronic intestinal nephritis/calculus disease/obstructive nephropathy	10.6
Unknown /other	29.7

Figure 6:*Data from the CKD registry of India 2008, Illustrate from Brenner and Rotor's The Kidney 9th edition, Toal et al 2011.*

Referrals Patterns

The impact of the time of referral on the outcome of ESRD is receiving a lot of attention in the developed world. Due to the lack of resources in the developing world, pre-dialysis scare is almost non-existence outside a few selected institutions (Nahas et al 2005).

Renal Replacement Therapy Cost

The exact cost of Renal Replacement Therapy (RRT) in developing countries is hard to estimate. The cost of treatment varies with the prescription and the way unit is set up. The exact proportion of cost that is formed by the subsidy provided by government hospital is very difficult to calculate. The expense incurred in setting up and maintenance of the units and the salaries paid to the physicians, nursing and other staff are included in the global hospital budget, and separate information is generally not available (Nahas et al 2005).

CHAPTER 2- METHOD AND MATERIALS

2.1 Description of the method

The comprehensive review of literature on the different perspectives of the psychological and psycho social aspects of ESRD Patients Undergoing Hemodialysis showed the extent to which various psychological aspects effect the medical outcome of the dialysis process. The process of how the physiological indicators like serum albumin, creatinine, and Inter dialytic weight gain and the aspect of physical functioning relate to the components that are known indicators of psychological wellbeing among ESRD patients like depression, anxiety, Illness intrusiveness and Quality of life are need to be explored. It has also brought to light many unresolved research issues relating to identifying the interactive pattern between psychological and physiological aspects of ESRD, which needs to be addressed efficiently, therefore it is very few imperative that empirically based evidence is available to draw meaningful inferences. Based on the review of literature, several hypotheses were formulated and the research design was finalized to meet the key objectives of the study.

2.2 Research Design

The descriptive survey research design was followed in this study to examine the nature of psychological and psychosocial aspects of depression, anxiety, illness intrusiveness and Quality of Life-physical and Quality of life-health and also look into the aspects of certain key physiological aspects like serum albumin, creatinine, IWG and physical activity. Relationship between these aspects can open doors to how the influence on one variable can have an effect on the other and change the course of approach in addressing medical and health outcome among ESRD patients. Comprehensive standardized questionnaires measuring various dimensions have been administered to the elicit the required data. The variables include in the study are discussed below:

Independent Variables: In the current study, the following independent variable are chosen as the patients who are diagnosed with ESRD are likely to face more physical and psychological problems and some significant life changes may likely to undergo in the process of the Hemodialysis. The independent variables studied are:

- Depression
- Anxiety
- Illness Intrusiveness
- Quality of Life –Physical
- Quality of Life – Health

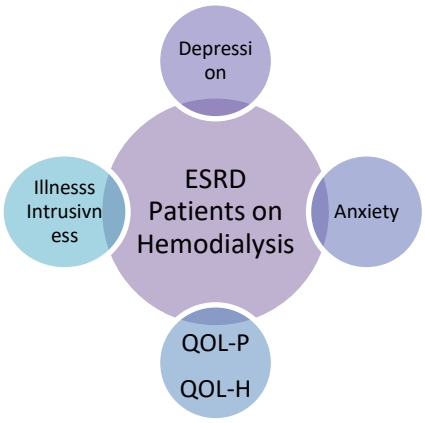


Figure 8: Psychological and psychosocial aspect of ESRD of patients undergoing HD that are independent variables for the study.

Dependent Variables: The physiological variables that are considered for the study are the key indicators of health in ESRD patients undergoing hemodialysis. They have shown to be measures that highlight the medical outcome of the patients. The dependent variables are Serum albumin, Creatinine, IWG and Physical activity.

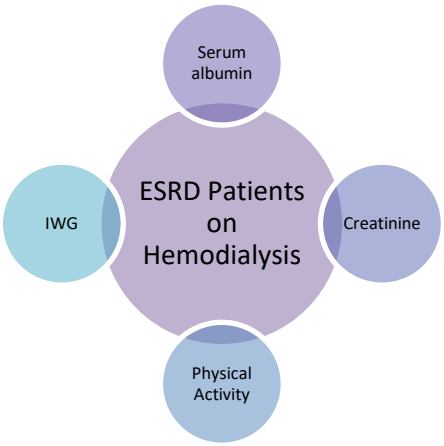


Figure 9: Physiological aspect ESRD of patients undergoing HD that are dependent variables for the study.

2.3 Sample Design

The current study targets a specific population of individuals undergoing hemodialysis. A purposive sampling technique was used in the study. The sample was collected from the concerned hospitals, which rendered medical assistance to those ESRD patients who need hemodialysis as treatment. All these hospitals and dialysis clinics are situated in and around Chennai, which offered hemodialysis as renal replacement therapy. The hospitals and organizations have given permission to approach the concerned ESRD patients to collect the required data. The assurance was given to the hospitals and the patients that the elicited data from them will used exclusively for the research purpose, and only the summarised group results will be recorded for the analysis and interpretation. Also, the anonymity of the patients was preserved. As per the ethical consideration, the briefing of the research project highlighting the aims and objectives and its utility value were given to each one of the patients. Also, the informed consent was taken directly from the patients.

There is no clear cut data available about the ESRD patients in India. A study by Sakhuja &. Kohli (2006) describe that 10% to 20% of the Indian population. Based on these factors and the population of Chennai (population database; India online pages.com) the sample size was estimated as given below by the use of Power analysis. The findings noted that the population in Chennai with a confidence level of 95% and a confidence interval aiming at 10% of the population gave predictive sample size of 139.

For the current study a total of 155 patients who have been undergoing regular treatment, only a sample of 127 was taken, 14 of the patients were unable to complete the assessment (due to physical discomfort), 6 patients dropped out from the study and 8 individuals did not follow up for the second session of assessment.

ELIGIBILITY

Inclusion Criteria:

- Patients with age group ranging from 25- 60 years, with both genders (Working age).
- Patients with a diagnosis of chronic renal disease (end stage) in hemodialysis for at least 3 months.
- Individuals who at least have secondary education.

Exclusion Criteria:

- Patients in process of renal transplant with living donor
- People with impairment orientation
- Individuals who are unable to comprehend /cooperate for assessment
- Current substance abuse
- Scoring less than 5 on GHQ (General Health questionnaire)

2.4 Research Instruments

The list of questionnaires used in the study are listed below and a sample of the same is attached in the appendix:

Informed consent form

Informed consent was obtained from the patient to participate in the study.

Socio Demographic Data

Demographic data sheet was prepared for the present study to collect relevant clinical data from the client. The data collected addressed the patients Gender, Age, Education, Occupation, Marital Status, Religion, Socioeconomic status and Years of dialysis.

General Health Questionnaire (GHQ-12) (Goldberg; 1972)

The general health questionnaire was designed to be self-administered screening test aimed at detecting psychiatric disorder among respondents in community setting and non-psychiatric clinical settings, such as primary care or among general medical outpatients. It is aimed at detecting those psychiatric disorders, which may have relevance to a patient's presence in a medical clinic and focusing on psychological components of ill-health.

Scoring

The items are scored using a likert score of (0-1-2-3). The questionnaire was completed within 10 minutes and scale was scored and interpreted quantitatively. A score of 5 and above is indicative of clinical level of psychological ill health.

Becks Depression Inventory II (BDI-II) (Beck et al 1996)

The BDI-II is a 21-item self-report instrument for measuring the severity of depression in psychiatrically diagnosed adults and adolescent patients of age group of 13 years and older. The BDI –II was developed as an indicator of the presence and degree of depressive symptoms consistent with the DSM IV, not as an instrument for specifying a clinical diagnosis.

Scoring

BDI-II is scored by summing the ratings for the 21 items. Each items rated on a four point rating scale ranging from 0-3. If a client has made multiple endorsements for an item, the alternative with the highest rating is used. The maximum score is 63.Special attention must be paid to correct scorings of item 16 and 18, each of these items contain seven options in the order as 0, 1a,1b,2a,2b,3a,3b, to differentiate between increase and decrease of in behaviour or motivation .The Scores are interpreted in the following manner

Total Score	Range
0-13	Non Depressed
14-19	Mildly Depressed
20-28	Moderately Depressed
29-63	Severely Depressed

Becks Anxiety Inventory (BAI) (Beck et al 1988)

The Becks Anxiety Inventory (BAI) was developed by Beck et al (1988). It is a 21 item scale that measures the severity of anxiety in adults and adolescents. The BAI was constructed to measure the symptoms of anxiety, which are minimally shared with those of depression, such as those symptoms measured by the revised BDI (Beck &Steer 1987). This lead to a manualized version of the Becks Anxiety Inventory (Beck &Steer 1990)

Scoring

The BAI score is derived based on the sum of all the rating given by the client for the 21 symptoms. Each symptom is rated on a 4-point scale ranging from 0-3. The maximum score is 63.The score range that is recommended for interpretation are as follows

Total Score	Range
0-7	Minimal Anxiety
8-15	Mildly Anxiety
16-25	Moderately Anxiety
26-63	Severely Anxiety

Adapted Illness Intrusiveness Rating Scale

The Adapted illness intrusiveness rating scale is the adapted version of the original Illness Intrusiveness scale developed by Devins et al (1983,1990). The adaptive scale was modified by adding some words to each category to make the questions clearer. In this modified version – a category called "non applicable category" was added because in the original scale the instruction was to circle the response "1" if the item is not applicable which resulted in missing data, especially in the areas of sex, self –expression, religious expression and community involvement. The adding of the "non applicable" category has greatly reduced missing responses. This is a good scale to measure role function; it measures a broad spectrum of life's roles. There are phrase like " How does your illness or treatment interfere with the things you drink and eat " that are rated on a 7 point rating scale with 1 being Not very much and 7 being very much.

The psycho metric properties of the scale indicate good internal consistency and reliability of 0.89. Self-administered method was followed to elicit the required data from the respondents.

Scoring

This scale has 5 subscales such as Physical Well-Being and Diet Items, Work and Finances Items, Marital, Sexual, and Family Relations Items, Recreation and Social Relations and Other Aspects of Life. Subscale scores are the mean of the items within each subscale. To score the scale, average the subscale scores to correct for differences in the numbers of items combined. One can also generate a total Perceived Intrusiveness score by summing the individual items. In the current study the summated scores of all items are used.

Kidney Disease Quality of Life Short Form (KDQOL-SF) - version 1.3(Hays et al; 1995)

The Kidney Disease Quality of Life (KDQOL) Instrument is a self-report measure developed for individuals with kidney disease and on dialysis (Hays, Kallich, Mapes, Coons, & Carter, 1994). Despite the outstanding psychometric performance of the KDQOL, some investigators may be reluctant to use it because of its length. The KDQOL-SF1.3 includes 43 kidney-disease targeted items as well as 36 items that provide a generic core and an overall health rating item.

Scoring

In the scoring process of KDQOL-SF pre-coded numeric values for responses on some of the KDQOL-SF items are in the direction such that a higher number reflects a more favourable health state. For example, a response of "None of the time" for item 10 corresponds to a pre-coded value of "5." However, pre-coded values for some of the items on the KDQOL-SF are in the direction such that a smaller number reflects a more favourable health state

The scoring procedure for the KDQOL-SF first transforms the raw pre-coded numeric values of items to a 0-100 possible range, with higher transformed scores always reflecting better quality of life. Each item is put on a 0 to 100 range so that the lowest and highest possible scores are set at 0 and 100, respectively. Scores represent the percentage of total possible score achieved

Four of the KDQOL-SF items require additional instructions. Items 17 and 22 need to be multiplied by 10 to put them on a 0-100 possible range. Item 23 is on a 1-7 pre-coded range. To recode this item, subtract 1 (possible minimum) from the pre-coded value, divide the difference by 6 (difference between possible maximum and minimum), and then multiply by 100. Item 16 needs to be considered with creating the sexual function scale

In the second and final step of the scoring process, items in the same scale are averaged together to create the scale scores. The tabulated format of the scoring and the criteria scoring are tabulated and presented in appendix at the end of the chapter. Items that are left blank are not taken into account when calculating the scale scores. Hence, scale scores represent the average for all items in the scale that the respondent answered. If

the answer to item 16 is "no," the sexual function scale score should be coded as missing. The sub scale of patient satisfaction and dialysis staff support were not included in the current study as, the patients were taken from different dialysis centres and may show discrepancy in the findings. The scales are listed below.

QOL – Physical	**QOL- Health Survey**
Symptoms	Physical Functioning
Effect of Kidney disease	Role Physical
Work Status	Pain
Cognitive Functions	General Health Perception
Quality of Social Interaction	Emotional Well being
Sexual Functions	Role Emotional
Sleep	Social Functioning
Social Support	Energy

The areas addressed by the items relating to Quality of life –physical (QOL-P) are described as below.

a) Symptoms – assesses the way in which ones quality of life is affected by the symptoms of diagnosis and treatment of kidney disease.

b) Effect of Kidney Disease – evaluates as to how much of an impact the kidney disease diagnosis and treatment has on the individuals functioning.

c) Work status- address the effect of being occupied and unemployed as the outcome of diagnosis and treatment of kidney disease

d) Cognitive functioning- screens for the changes in the individuals cognitive functioning post the illness and treatment for kidney diseases

e) Quality of Social Interaction – assesses how much of social change occurs being diagnosed and under treatment for kidney disease

f) Sleep- the changes in quality and sleep pattern for individuals diagnosed and under treatment for kidney disease is evaluated.

g) Social support – the changes in the support from friends and family is assessed for patients with diagnosis and treatment of kidney disease

The areas addressed by the items relating to Quality of life –Health (QOL-H) are described as below.

a) Physiological factors – the physiological changes that occurs on diagnosis of kidney disease and the treatment process are evaluated.

b) Role Physical – The changes in the physical role of the individual in the environment on diagnosis and treatment of kidney disease are evaluated.

c) Pain-the experience and management of pain in kidney disease and its treatment are evaluated.

d) General Health perception – the general idea of the individual's current health status on diagnosis and treatment of kidney diseases.

e) Role Emotional – the emotional changes the individual under goes on dialysis are evaluated.

f) Social Functioning – the amount of social life the individual has and is involved in on diagnosis and treatment of kidney disease are assessed.

g) Energy – the level of being energetic or feeling of fatigability on the diagnosis and treatment of kidney disease are evaluated.

Kornofsky Performance Status Scale (Karnofsky & Barchenal 1949)

Kornofsky Performance Status Scale (KPSS) is a physician rating scale that guarantees an objective assessment of the patient's clinical state. It was originally designed to assess quality of life in patients receiving cancer chemotherapy but has since been used in different disease states. It is perhaps the most commonly used health related Quality of life instrument. The Karnofsky Performance Status Scale (KPS) is widely used to quantify the functional status of cancer patients. Arogundade et al (2004) used KPSS in his study and found that it had good correlation with KDQOL-SF and was able to give performance status of Hemodialysis Patients. The primary purpose of its development was to allow physicians to evaluate a patient's ability to survive. The scale consists of short statements such as “Unable to work a- able to live at home and care for most personal needs.”

Scoring

There are various scoring systems. The most generally used is the Karnofsky score and it is also being used in publications by the World Health Organization. The Karnofsky score runs from 100 to 0, where 100 is "perfect" health and 0 is death. Although practitioners occasionally assign performance scores in between standard intervals of 10.

The Level of Interdialytic Weight Gain, Creatinine &the Serum albumin level

The level of interdialytic weight gain is recorded by subtracting the individual weight prior dialysis from the individual’s ideal weight. This information can be obtained from the individual’s clinical file as it is recorded before each session of dialysis. The inter dialectic weight was taken from the individuals previous four visits and an average was determined to give an ideal weight gain.

The above same method was done to obtain the creatinine and serum albumin level of the patient; the patient’s blood test results from previous three tests were taken and the average was taken to determine the ideal level of Creatinine and Serum albumin levels.

2.5 Procedure of the study

The sample for the data collection was taken from hospitals and private dialysis clinics. Though hospital gave access to patients on dialysis but the strictly expected confidentiality on not revealing the name of the hospital or organization. They also told that informed consent for participation in the present study must be obtained before administered in the questionnaires or interviewing the patients. So individual informed consent was taken from every patient who volunteer for the study after they were educated on the need and outcome of the study.

The data collection was started by first approaching the clients individually and explaining the purpose and the implication of the study and informant consent was obtained from the client. The Socio demographic details of the client was collected. They were checked for inclusion and exclusion criteria and following which GHQ was administered (a score of 5 and above were considered in to the study as it is indicative of psychological distress) based on which they were included in the study.

The process took about 1 hour and 30 minutes and at sometimes, 2 hours based on the comfort of the patient. The data collection process was divided over two sessions during the four-hour dialysis session. The patients also given time to talk about their difficulties and based on their assessment they are also given a self-help session that may be useful to them in coping with their dialysis therapy.

The tests were administered in the following order to the patients.

1. Consent form
2. Socio-demographic data
3. General Health Questionnaire
4. Becks Depression inventory II
5. Becks Anxiety Inventory
6. Adaptive Illness Intrusiveness rating scale
7. Kidney Disease Quality of Life Questionnaire-Short Form

The tests were administered in a two session lasting for 45 minutes (approx.). The researcher asked the questions when the patient was unable to understand the questions asked and the answers given accordingly. The

consent for allowing to withdraw from the participation of this exercise was granted to them, if they are unwilling to follow through with the study.

Ethical consideration

All ethical aspects were taken in to consideration. The institute and the doctors were informed about the study. The patients were informed in detail about the purpose and the outcome of the study. They were also only taken into study after a consent form was signed in the presence of a witness. Post participation counselling was carried out for about 20 minutes and given a brief hand out on the ways in which a proper coping can be carried out to face the Hemodialysis patients.

2.6 Statistical Technique

The collected data was analyzed by using parametric test such as Pearson product movement correlation, and linear regression analysis to establish a relationship and prediction of correlation between variables considered for the study. Figure 9 illustrates, the study design with the statistical technique and the study outcome. The statistical analysis was carried out using SPSS- 19. A confidence interval level of 95 % was used through-out the statistical analysis.

CHAPTER 3-RESULTS AND DISCUSSION

The present study aims at evaluating the relationship between psychological and physiological factors in End Stage Renal Dialysis (ESRD) patients undergoing Hemodialysis (HD). The statistical tool used to analyse the data were Pearson's product moment correlation and the significant key variables in the study were further analysed using Linear regression.

3.1. Discusses Demographic characteristics of ESRD patients undergoing hemodialysis

The demographic details of the patients who participated and completed the study are given in Table 1. The mean age of the patiens were 45.57±9.51, the mean value of the patient's frequency of dialysis sessions per week and the years of dialysis attended by them are 2.01±0.21 and 2.76±1.37 respectively.

Table 1. Demographic details of the ESRD patients.

Demographic Variable	Mean ± Sd	Demographic Variable		%
Age	45.59 ± 9.51	Gender	Male	54.3
			Female	45.7
Frequency of Dialysis	2.01 ±0.21	Marital Status	Married	95.3
			Single	4.7
Years of dialysis	2.76 ±1.37	Years of Education	Secondary	7.1
GHQ	8.50 ±1.61		Higher Secondary	24.4
			Graduate	68.5

The current study includes the General Health Questionnaire 12 (GHQ-12) as the platform for assessing the eligibility of the participants to be included in the study. According to Goldberg (1972) an individual scoring more than 5 is noted to have psychological disturbances that require medical attention. The mean score of the individual on GHQ was 8.50±1.61, indicative of the participants' eligibility for the study.

The demographic details relating to the gender of the participants showed that 54.3% were males (69) and 45.7% were females (58). The demographic details also indicated that 95.7 % (121) of the individuals were married and 4.7 % (6) were single. All married patients are living with spouses except three patients. The educational back ground of the patients showed that 7.1 % were educated up to secondary education, 24.4 % with higher secondary education and the rest 68.5% has at least a graduate degree.

4.2 Relationship between physiological variables and psychological variables.

The correlation between physiological variables and psychological variable in the study are represented in Table 2.1 The findings indicated that serum albumin is negatively correlated with anxiety with an r value of (-0.222) which is significant at $p \leq 0.01$ level. The significant level of correlation explains that serum albumin level increases when the individual have low anxiety.

Positive correlation was noted between creatinine and illness intrusiveness and depression with an r value of (0.253) and (0.204) which is significant at $p \leq 0.01$ level and $p \leq 0.05$ level respectively. The significant correlation showed that when illness intrusiveness increases creatinine also increases. Similarly when depression level increases, correspondingly the level of creatinine level increases.

Illness intrusiveness and anxiety

Illness intrusiveness and anxiety were found to be positively correlated with IWG with an r value of (0.247) and (0.203), significantly at $p \leq 0.01$ level and $p \leq 0.05$ level respectively. The significant relationship indicates that when illness intrusiveness increases IWG also increases, anxiety also has the same effect with IWG.

Depression was noted to be negatively correlated with physical activity at a significant level with an r value of (-0.209) at $p \leq 0.05$ level. The significant correlation indicating that when physical activity increases depression decreases.

Table 2.1 Correlation between key psychological variables and physiological variables of ESRD patients on HD.

	Illness Intrusiveness	BDI	BAI	QOL-ESRD Physical	QOL-Health Survey
Serum Albumin	**.003**	**.094**	**-.222****	**.030**	**-.066**
Creatinine	**.253****	**.204***	**.162**	**.078**	**-.123**
IWG	**.247****	**-.055**	**.203***	**.040**	**-.170**
KPS	**-.065**	**-.209***	**-.040**	**.040**	**-.170**

**. Correlation is significant at the 0.01 level.
*. Correlation is significant at the 0.05 level.

Table 2.2 Correlation between Physiological variables.

	IWG	KPS
Serum Albumin	**-.046**	**-.103**
Creatinine	**.151**	**-.190***

**. Correlation is significant at the 0.01 level.
*. Correlation is significant at the 0.05 level.

Table 2.3 Correlation between psychological variables

	Illness Intrusiveness	BDI	BAI
QOL ESRD Physical	**.046**	**.079**	**.226***
QOL Health Survey	**-.113**	**.096**	**-.001**
BDI			**0.348****

**. Correlation is significant at the 0.01 level.
*. Correlation is significant at the 0.05 level

3.3 Relationship between physiological variables

The understanding of the relationship among the physiological variables is indicated in Table 2.2. The results showed that creatinine is negatively correlated with physical activity with an r value of (-0.190) which is significant at $p \leq 0.05$ level. This indicated that creatinine level is likely to increase when physical activity is bound to reduce.

3.4 Relationship between psychological variable

The correlation between psychological variables were shown in table 2.3, The results showed that there is a positive correlation between depression and anxiety with an r value of (0.348) which is significant at $p \leq 0.01$ level. This correlation indicated that an increase in depression tend to increase the level of patient's anxiety. Table 2.3 also showed a significant positive correlation between anxiety and quality of life physical, with an r value of (0.226) which is significant at $p \leq 0.05$ level. The finding indicated that when the level of anxiety increases, the quality of life physical is also likely to increase significantly.

3.5. Relationship between Quality of life and physiological factors

The correlation between physiological variables; serum albumin, creatinine, IWG and physical activity with the sub scales of quality of life physical (QOL-P); Symptoms, effect of kidney, burden of kidney, work status, cognitive function, social interaction, sexual dysfunction, sleep and social support are indicated in Table 3. The results revealed that there is negative correlation between serum albumin and QOL-P social support with an r value of (-0.195) which is significant at $p \leq 0.01$ level. This indicates that when QOL-P social support reduces the serum albumin level increases correspondingly.

Physical activity was noted to be negatively correlated with QOL-P symptoms with an r value of (-0.199) which is significant at $p \leq 0.05$ level. This showed that when the physical activity increases, the QOL-P symptoms also reduces correspondingly.

Table 4 showed the correlation between physiological variable serum albumin, creatinine, IWG and physical activity with the sub scales of quality of life QOL-H; physical functioning, role physical, pain, general health, emotional wellbeing, role emotion, social functioning and energy. There was a negative correlation between serum albumin and QOL-H physical functioning with an r value of (0.252) which is significant at $p \leq 0.01$ level

This indicated that an increase in one's physical functioning led to an increase in serum albumin level. There was also a negative correlation between IWG and QOL-H role physical with an r value of (0.287) which is significant at $p \leq 0.01$level. The increase in IWG reduces one's QOL-H role physical.

3.6. Relationship between Quality of life and psychological variables

The correlation between physiological variables; depression, anxiety and illness intrusiveness with the sub scales of quality of life physical (QOL-P); Symptoms, effect of kidney, burden of kidney, work status, cognitive function, social interaction, sexual dysfunction, sleep and social support are indicated in Table 5. The findings showed that there was a negative correlation between anxiety and sleep with an r value of (-0.224) which is significant at $p \leq 0.05$ level. It can be inferred that an increase in anxiety will result in decreased sleep.

Table 6 showed the correlation between psychological variables; depression, anxiety, illness intrusiveness with the sub scales of quality of life QOL-H; physical functioning, role physical, pain, general health, emotional wellbeing, role emotion, social functioning and energy. There was no significant correlation found between the variables.

3.7Relationship sub scales of QOL-P and sub scales of QOL-H.

The correlation between subscales of QOL-P; Symptoms, effect of kidney, burden of kidney, work status, cognitive function, social interaction, sexual dysfunction, sleep and social support with sub scales of QOL-H physical functioning, role physical, pain, general health, emotional wellbeing, role emotion, social functioning and energy are indicated in Table 7

There was positive correlation noted between QOL-P symptoms with QOL-H pain with an r value of (0.209) significant at $p \leq 0.05$ level. This shows that when symptoms increases, the pain also increases correspondingly.

Table 3 Correlation between Key Physiological variables and Quality of life – Physical of ESRD patients on HD

	Symptom	Effect of KD	Burden of KD	Work Status	Cognitive Function	Social Interaction	Sexual dysfunction	Sleep	Social Support
Serum Albumin	**.012**	**-.020**	**-.065**	**.050**	**.065**	**.173**	**.100**	**.032**	**-.195***
Creatinine	**.137**	**.042**	**.029**	**-.072**	**-.012**	**.104**	**.074**	**.064**	**-.037**
IWG	**.145**	**.057**	**-.093**	**-.110**	**.060**	**.099**	**-.097**	**.137**	**-.008**
KPS	-.199*	-.094	.003	.063	-.031	-.068	.082	-.135	.135

**. Correlation is significant at the 0.01 level.
*. Correlation is significant at the 0.05 level.

Table 4 Correlation between Key Physiological Variables and Quality of Life – Health Survey of ESRD patients on HD

	Physical Functioning	Role Physical	Pain	General Health	Emotional Wellbeing	Role Emotional	Social Functioning	Energy Fatigue
Serum Albumin	**-.252****	**.038**	**.012**	**-.018**	**.006**	**-.021**	**-.047**	-.003
Creatinine	**-.053**	**-.091**	**-.030**	**.020**	**-.160**	**-.132**	**.076**	.042
IWG	**.052**	**-.287****	**-.030**	**.046**	**-.146**	**-.081**	**.045**	-.087
KPS	-.013	-.010	-.035	.051	.045	.116	.018	-.051

**. Correlation is significant at the 0.01 level.
*. Correlation is significant at the 0.05 level.

Table 5 Correlation between Key Psychological Variables and Quality of life – ESRD Target variables of ESRD patients on HD

	Effect of KD	Burden of KD	Work Status	Cognitive Function	Social Interaction	Sexual Dysfunction	Sleep	Social Support
BDI	**-.112**	**.114**	**.007**	**.067**	**-.051**	**.039**	**-.131**	**-.043**
BAI	**-.066**	**.055**	**-.012**	**-.160**	**-.099**	**.138**	**-.224***	**-.110**
Illness Intrusiveness	**.024**	**-.140**	**.080**	**.087**	**.168**	**-.081**	**-.003**	**-.037**

**. Correlation is significant at the 0.01 level.
*. Correlation is significant at the 0.05 level.

Table 6 Correlation between Key Psychological Variables and Quality of life – Health survey of ESRD patients on HD

	Physical Functioning	Role physical	Pain	General Health	Emotional Wellbeing	Role Emotional	Social Functioning	Energy Fatigue
BDI	**-.015**	**-.019**	**-.071**	**-.079**	**-.024**	**-.066**	**-.026**	**-.065**
BAI	**-.109**	**.129**	**-.028**	**-.024**	**-.065**	**.078**	**-.042**	**-.009**
Illness Intrusiveness	**-.105**	**-.126**	**.006**	**.035**	**.046**	**-.152**	**.085**	**-.102**

**. Correlation is significant at the 0.01 level.
*. Correlation is significant at the 0.05 level.

Table 7 Correlation between Quality of life – Physical and Quality of Life Health of ESRD patients on HD

	Physical Functioning	**Role physical**	**Pain**	**General Health**	**Emotional Wellbeing**	**Role Emotional**	**Social Functioning**	**Energy Fatigue**
Symptoms	**-.074**	**-.149**	**.209***	**.026**	**-.027**	**-.056**	**.068**	**-.109**
Effect Of KD	**-.081**	**-.096**	**.031**	**.104**	**.000**	**-.077**	**.039**	**.023**
Burden of KD	**-.007**	**.275****	**-.032**	**.178***	**.098**	**.089**	**-.020**	**.184***
Work Status	**-.223***	**-.170**	**-.084**	**-.150**	**-.002**	**-.156**	**-.146**	**-.135**
Cognitive Functions	**-.089**	**-.244****	**.071**	**-.055**	**-.122**	**-.085**	**.016**	**-.253****
Social Interaction	**-.066**	**-.072**	**-.181***	**-.069**	**-.102**	**-.036**	**.101**	**.189***
Sexual Dysfunction	**-.144**	**-.017**	**.074**	**.005**	**-.101**	**.022**	**.062**	**-.054**
Sleep	**.060**	**.056**	**.035**	**.115**	**.175***	**.106**	**-.125**	**.010**
Social Support	.048	.065	-.088	-.027	.156	.074	.051	-.040

**. Correlation is significant at the 0.01 level.
*. Correlation is significant at the 0.05 level.

Positive correlation was also found between QOL-P burden of kidney and QOL-H role physical, QOL-H general health and QOL-H energy, with an r value of (0.275) which is significant at $p \leq 0.01$ level , (0.178) with significance at $p \leq 0.05$ level and (0.184) with significance at $p \leq 0.05$ level respectively. It can be inferred that whenever there is an increase in QOL-P burden of Kidney, the other parameters such as the QOL-H role physical, QOL-H general health and QOL-H energy are also likely to increase correspondingly.

There was a negative correlation between QOL-P work status and QOL-H physical function with an r value of (-0.223) which is significant at $p \leq 0.05$ level. Based on these results, it can be inferred that when QOL-P work stress increases, the level of QOL physical condition reduces correspondingly. QOL-P social interaction was negatively correlated with QOL-H pain with an r value of (-0.181) which is significant at $p \leq 0.05$ level. That is when social interaction increases; the perceived level of pain reduces correspondingly.

QOL-P social interaction also had a positive correlation with QOL-H energy with an r value of (0.189) which is significant at $p \leq 0.05$ level. Thus, an increased level in social interaction may likely to increase energy correspondingly. QOL-P cognitive function was negatively correlated with QOL-H role physical and QOL-H energy with an r value of (-0.244) which is significant at $p \leq 0.01$level and (-0.253) significant at $p \leq 0.01$ level. This explains that when cognition increases, the individual's role physical energy level likely to reduce correspondingly.

QOL-P sleep and QOL-H emotional wellbeing are positively correlated with an r value of (0.175) which is significant at $p \leq 0.05$ level. This correlation denotes that as sleep reduces ones emotional wellbeing also reduces.

3.8 Describes the Regression analysis of the chosen variables:

Linear Regression was carried out with those key variables that have significant correlation with each other. The regression analysis explores whether there is a linear or additive relationship among the variables. The regression analysis shown in Table 8.1 indicated Serum albumin and anxiety that noted aβ value of 0.22 and F= 6.48 with an R^2 value of 4% significant at 0.01 level. The histogram indicates and the normal P-P plot with minimal residual indicated in Figure11.1. This is indicative of the existence of a linear pattern of relationship between the interacting variable of Serum albumin and anxiety among ESRD patients undergoing hemodialysis.

The regression analysis between creatinine and physical activity is indicated in Table 8.2 that noted a β value of 0.19 and F= 4.67 with an R^2 value of 3% significant at 0.05 level. Figure 11.2 histogram indicates and the normal P-P plot that's close to normality. The plot also signifies the existence of a linear relationship between creatinine and physical activity in hemodialysis patients.

Table 8.3 show the regression between creatinine and illness intrusiveness and was noted a β value of 0.25 and F= 8.54 with an R^2 value of 6% significant at 0.05 level. The histogram in Figure 11.3 and the normal P-P plot indicates minimal residual plots, though linearity is well established between creatinine and illness intrusiveness for hemodialysis patients.

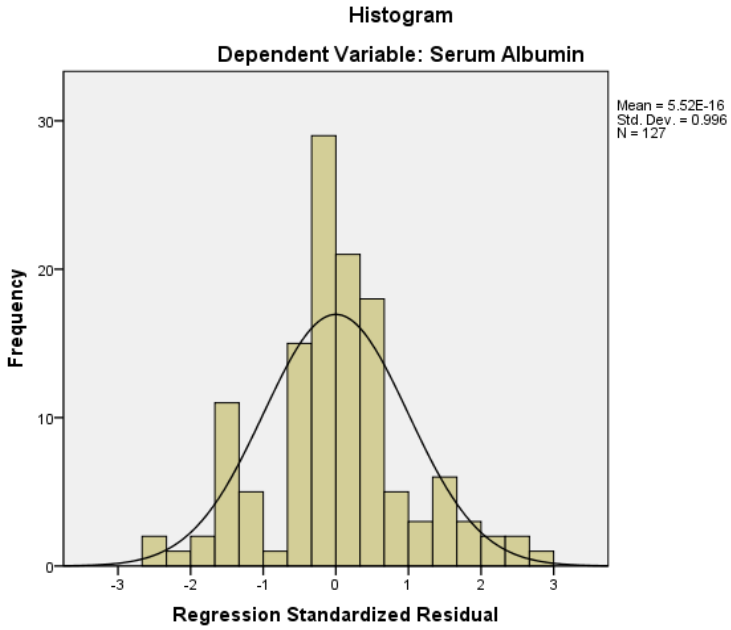
Creatinine and depression on regression gave a β value of 0.25 and F= 5.42 with an R^2 value of 4% significant at 0.05 level as indicated in Table 8.4 and Figure 11.4 shows the histogram and normal P-P plot indicates minimal residual. This indicates the existence of a linear relationship between creatinien and depression.

Table 8.5 indicates regression between IWG and Illness intrusiveness that noted a β value of 0.24 and F= 8.14 with an R^2 value of 6% significant at 0.01 level. The histogram and the normal P-P plot shown in Figure 11.5 where minimal residual was indicated, this follows through with idea of a linear relationship between IWG and illness intrusiveness in ESRD patients undergoing hemodialysis and the effect of illness intrusiveness on their fluidintake.

The regression analysis between IWG and anxiety is shown in Table 8.6 noted a β value of 0.20 and F= 5.39 with an R^2 value of 4% significant at 0.05 level. The histogram and the normal P-P plot with minimal residual plots are shown in Figure 11.6. The plotting is indicative of linear relationship between IWG and anxiety in ESRD patients that undergo hemodialysis.

Table 8.7 showed the regression between anxiety and QOL-P with a β value of 0.22 and F= 6.70 and an R^2 value of 5% significant at 0.01 level. Figure 11.7 indicates a minimal level of residual plots in histogram and the normal P-P plot. The normal plot is linear and indicative of a linear relationship between QOL-P and anxiety in ESRD patients on hemodialysis.

Figure 10.1 Linear regression between Serum albumin and anxiety among ESRD patients undergoing HD



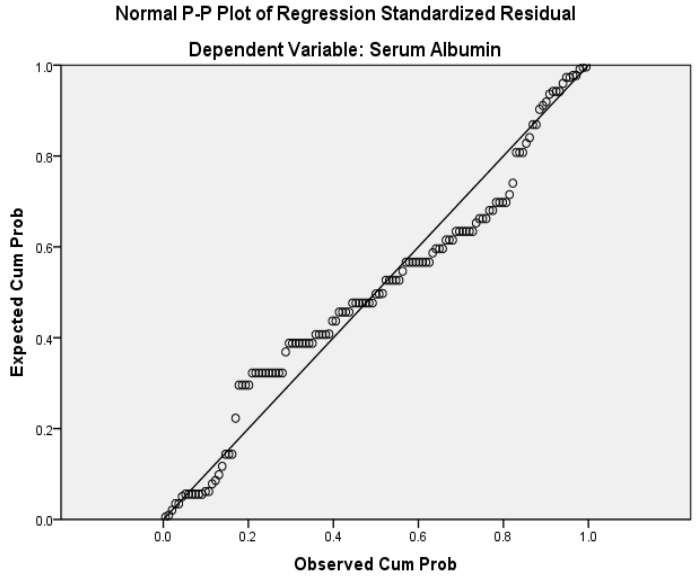


Table 8.1 Regression table with β, t and F value serum albumin and anxiety among ESRD patients undergoing HD

	R	R^2	Standardized Coefficients	T	Mean square	F	Significance
			Beta				
Serum Albumin (Constant)	0.222	0.049	-0.222	10.632	2.098	6.486	0.012
Anxiety				-2.547	0.012		

Figure 10.2 Linear regression between creatinine and physical activityamong ESRD patients undergoing HD

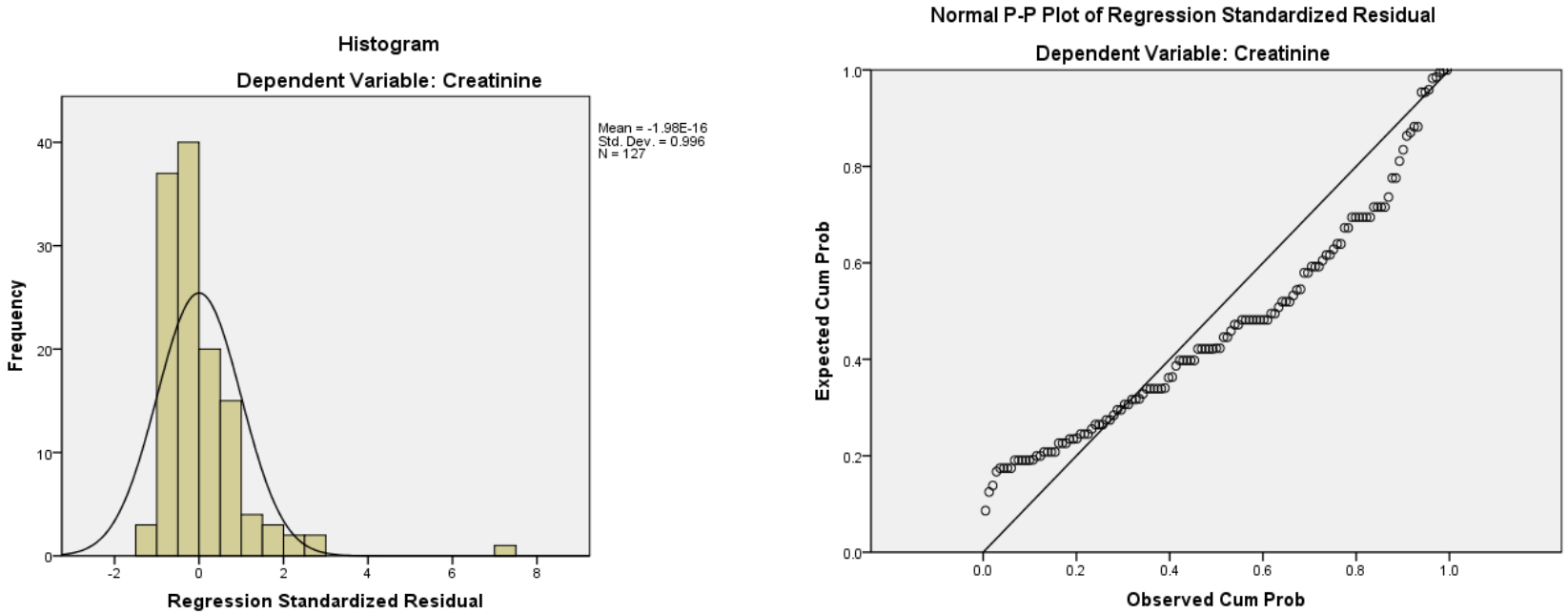
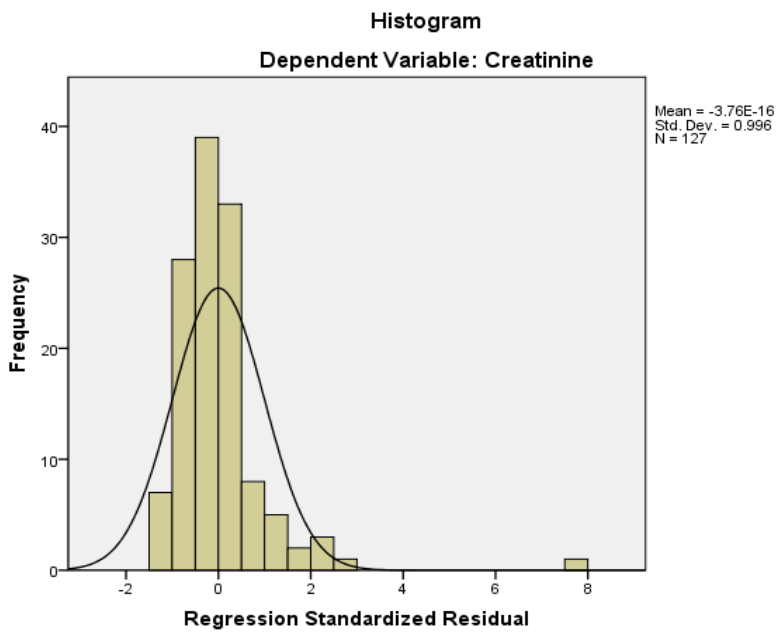


Table 8.2Regression table with β, t and F value creatinine and physical activityamong ESRD patients undergoing HD

	R	R^2	Standardized Coefficients Beta	T	Mean square	F	Significance
Creatinine				4.992	12.337		
Physical activity	.190	.036	-.190	-2.163	2.638	4.677	.032

Figure 10.3 Linear regression between creatinine and illness intrusivenessamong ESRD patients undergoing HD



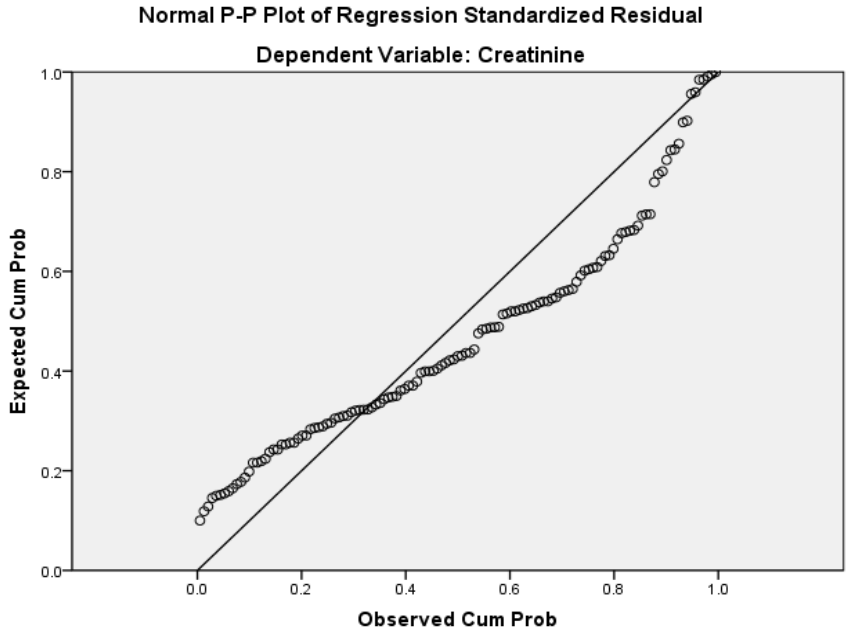
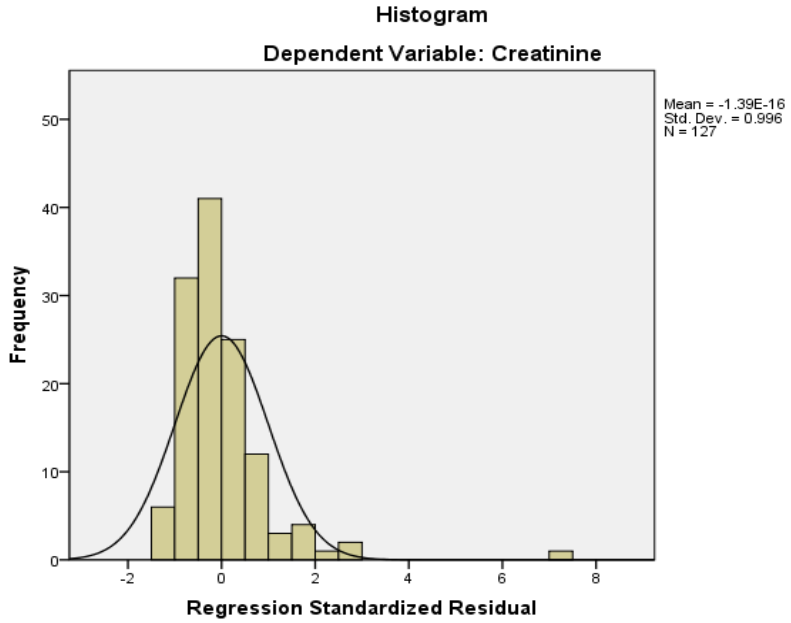


Table 8.3 Regression table with β, t and F valuecreatinine and illness intrusivenessamong ESRD patients undergoing HD

	R	R^2	Standardized Coefficients Beta	T	Mean square	F	Significance
Creatinine	.253	.064	.253	.998	21.883	8.544	.004
Illness Intrusiveness				2.923	2.561		

Figure 10.4 Linear regression between creatinine and depressionamong ESRD patients undergoing HD



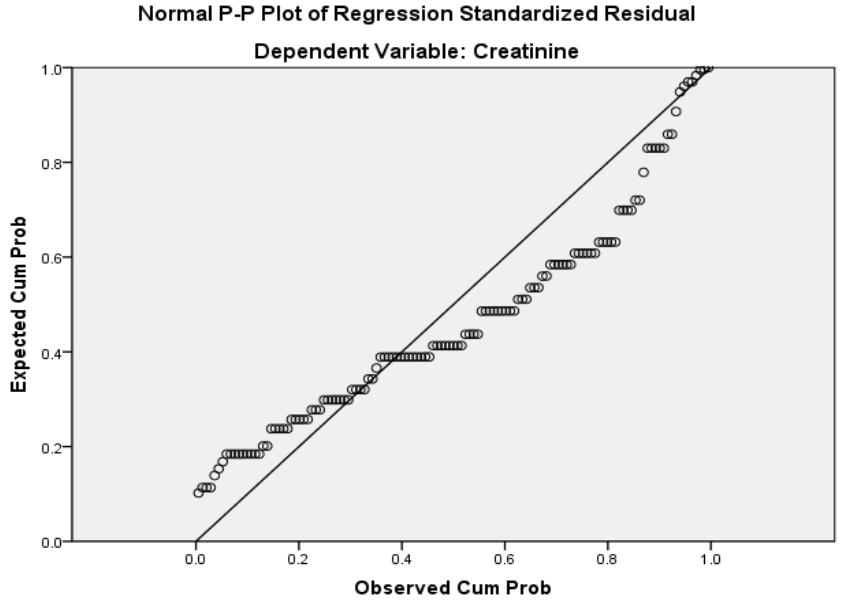


Table 8.4 Regression table with β, t and F value creatinine and depressionamong ESRD patients undergoing HD

	R	R^2	Standardized Coefficients Beta	t	Mean square	F	Significance
Creatinine				.444	14.236		
Depression	.204	.042	.204	2.330	2.622	5.429	.021

Figure 10.5 Linear regression between IWG and illness intrusiveness among ESRD patients undergoing HD

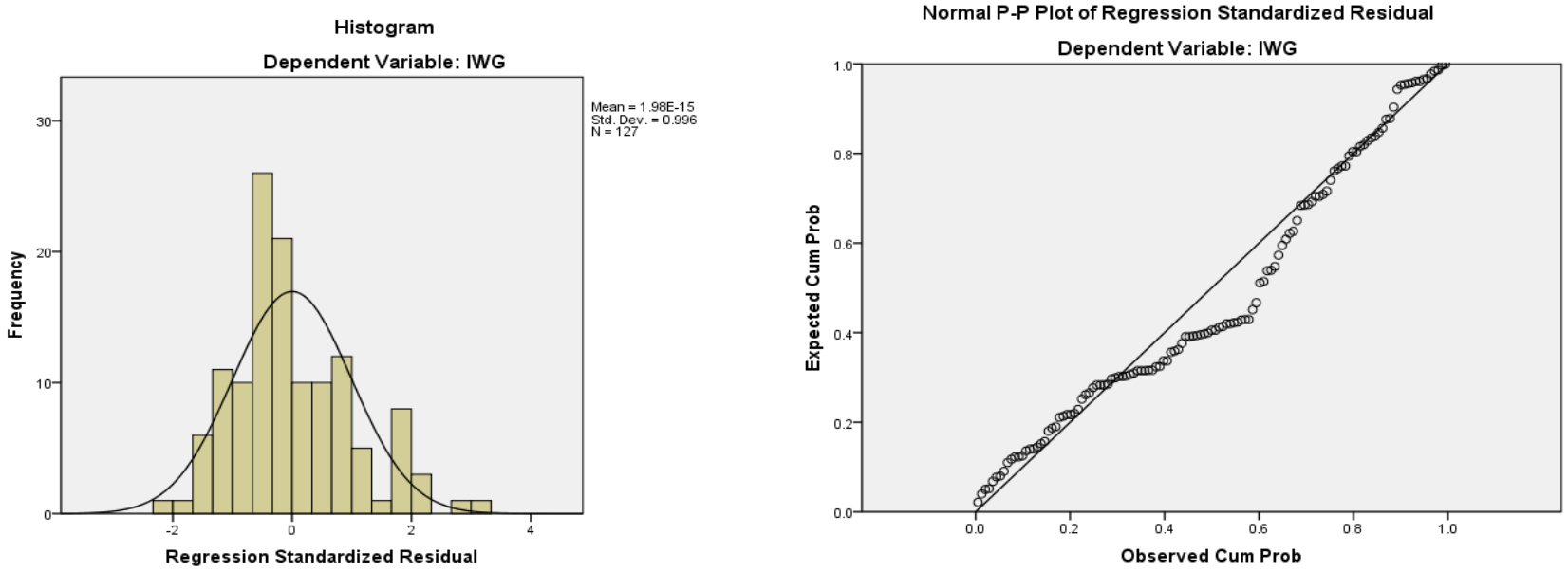


Table 8.5 Regression table with β, t and F value IWG and illness intrusiveness among ESRD patients undergoing HD

	R	R^2	Standardized Coefficients Beta	t	Mean square	F	Significance
IWG				4.764	3.604		
Illness Intrusiveness	.247	.061	.247	2.854	.443	8.144	.005

Figure 10.6 Linear regression between IWG and anxietyamong ESRD patients undergoing HD

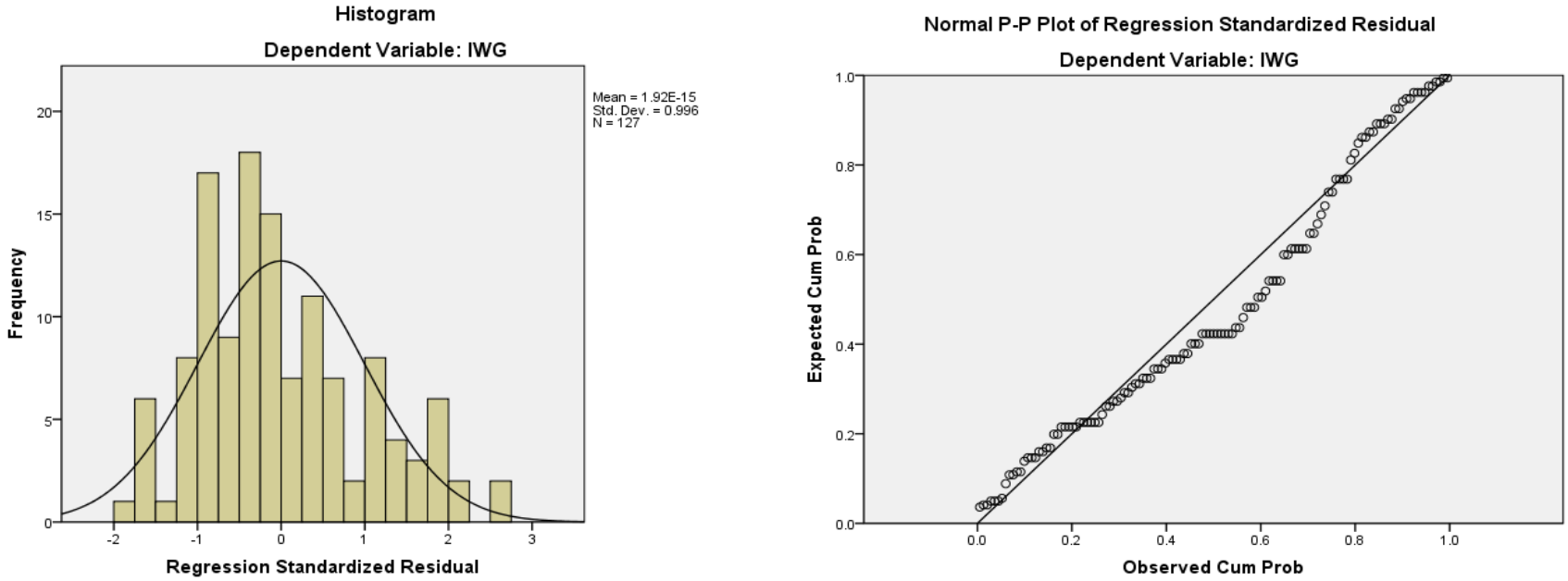
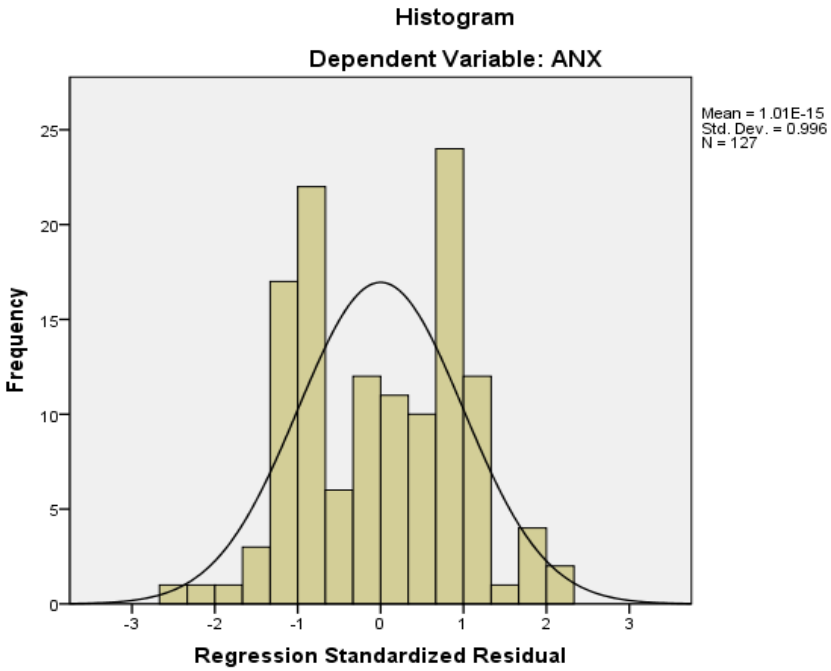


Table 8.6 Regression table with β, t and F value IWG and anxietyamong ESRD patients undergoing HD

	R	R^2	Standardized Coefficients Beta	T	Mean square	F	Significance
IWG				3.051	2.436		
Anxiety	.203	.041	.203	2.322	.452	5.391	.022

Figure 10.7 Linear regression between anxiety and QOL-P among ESRD patients undergoing HD



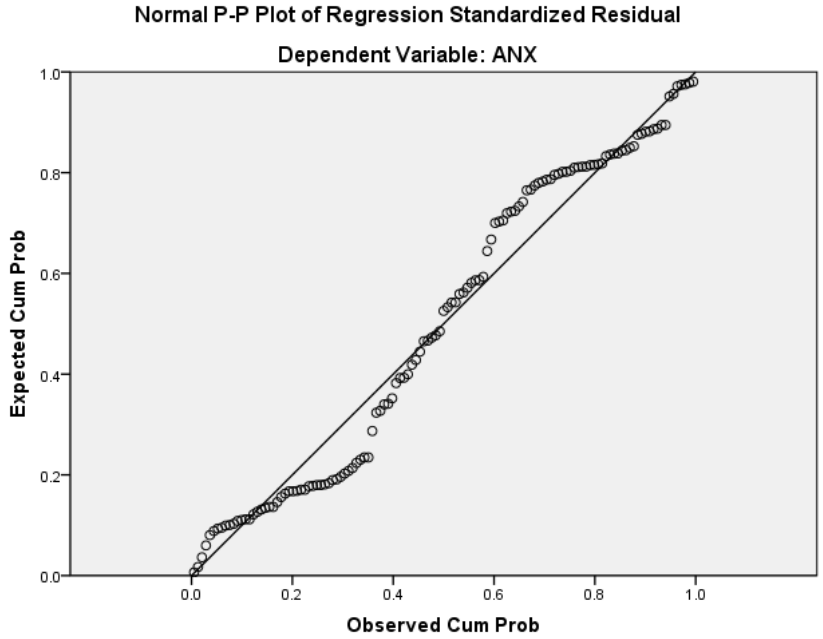
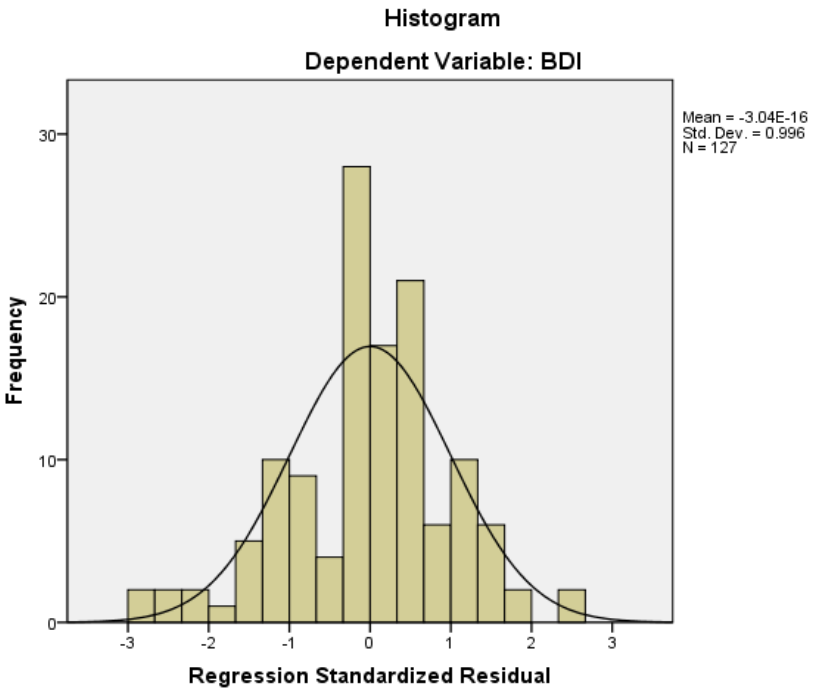


Table 8.7 Regression table with β, t and F value anxiety and QOL-P among ESRD patients undergoing HD

	R	R^2	Standardized Coefficients Beta	T	Mean square	F	Significance
Anxiety				8.547	6.474		
QOL- Physical	.226	.051	.226			6.702	.011
				2.589	.966		

Figure 10.8 Linear regression between depression and anxiety among ESRD patients undergoing HD



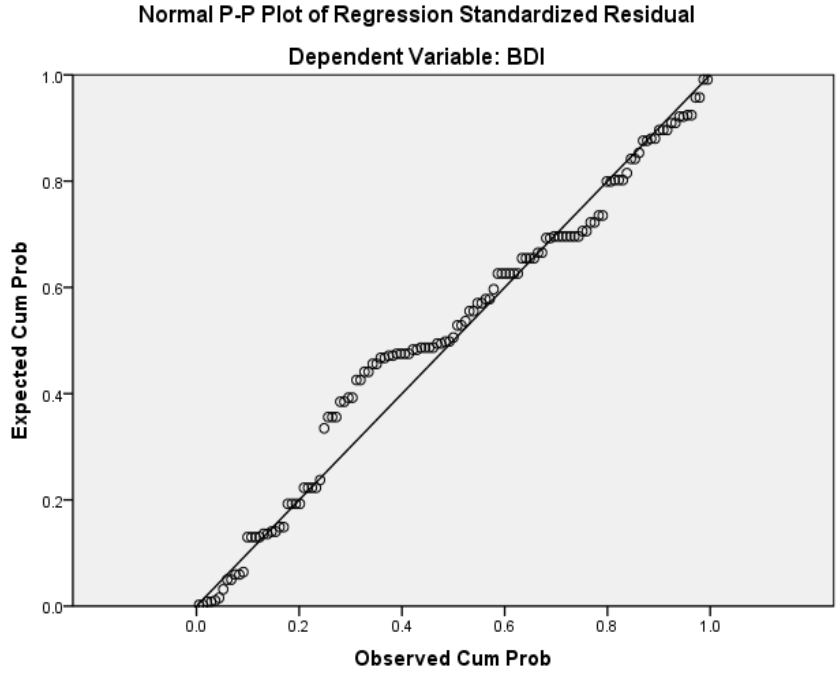


Table 8.8 Regression table with β, t and F value depression and anxietyamong ESRD patients undergoing HD

	R	R^2	Standardized Coefficients Beta	T	Mean square	F	Significance
Depression				13.772	268.33		
	.355	.126	.355			17.996	.000
Anxiety				4.242	14.911		

The regression between depression and anxiety was also analysed and the findings showed a β value of 0.35 and F= 17.99 with an R^2 value of 12% significant at 0.01 level this is also shown in Figure 11.8 where histogram and the normal P-P plot indicates minimal residual plots with linear graph that is indicative of a linear relationship between depression and anxiety in hemodialysis patients.

The regression values are noted to have low R^2 value though the regression was noted to be significant. This indicates small effect size, this can be justified due to the field of study i.e. the areas of human sciences. Hence even if R^2 value is low there is indication of a linear relationship between the variables.

The significant linear relationship highlighters the linear patter of the interaction of the key significant variables that have been analysed, this further lays the groundwork on how the interacting variable showing linearity in their interaction that signifies the parallel relationship between the psychosocial variables and physiological variables. Specific to Serum albumin- Anxiety, Creatinine- Physical activity, Creatinine – Depression, IWG- Illness intrusiveness, IWG- anxiety and Anxiety – QOL-P.

3.9 Discussion

The current study evaluates the relationship between psychological and physiological factors among ESRD patients. The psychological variables such as depression, anxiety, illness intrusiveness and Quality of life –physical (QOL-P) and Quality of life- health (QOL-H) of kidney disease were used for this present study. The sub scales of QOL-P; Symptoms, effect of kidney, burden of kidney, work status, cognitive function, social interaction, sexual dysfunction, sleep and social support with sub scales of QOL-H physical functioning, role physical, pain, general health, emotional wellbeing, role emotion, social functioning and energy were used in the study. The physiological variables used in the study are serum albumin, creatinine, IWG and physical activity.

The interaction between the variables indicated that the level of serum albumin is associated with anxiety. It can be inferred that the decrease in anxiety is likely to improve the serum albumin level which has a positive impact. Thus by reducing the level of anxiety among ESRD patients who are undergoing hemodialysis, there is likelihood that there can be a major improvement in the patients' health as their serum albumin level will help build up their health. There are no known conclusive findings in the past to highlight the fact that to what extent the presence of anxiety levels are likely to affect the level of serum albumin. The current study findings indicated that psychological intervention can be administered accordingly to reduce the anxiety levels among the patients which may likely to benefit in addressing serum albumin level among ESRD patients. Dimatteo et al (2000) supported this findings by stating that non-compliance to medical treatment of the patients is affected by anxiety and depression, i.e. the reduced level of patient's adherence is very much due to anxiety and depression.

The increased level of Creatinine is likely to increase alarmingly illness intrusiveness. Illness intrusiveness is one of the major interference in the health of the individual as it is the patient's own perception of what does such illness affect and its effect and out-come and more so the interference of such illness in their life. Possessing such negative perception of illness may adversely affect the status of one's' mental health which can have a varying effect about the overall health out-come.

The current study has noted that when illness intrusiveness increases, there is a likelihood of increasing the level of creatinine. Creatinine is one of the major indicators of health status of ESRD patients on dialysis. An increased creatinine has marked negative effect, whereby the study has indicated that if illness intrusiveness is predominant in nature of the patient then the individual's creatinine level does increase alarmingly. Though studies have not looked into the effect of the above variables, illness intrusiveness is known to have an impact on quality of life in ESRD patients across treatment modalities as assessed by Devins et al (1990). Devins et al (1997) also explained that the distress of the treatment regimen increases with the increase of illness intrusiveness, along with self-concept and age of the ESRD patients. Sack, Peterson & Kimmel (1990) in their study on ESRD patients and on HD, CAPD and Chronic renal insufficiency patients noted that there was a strong correlation between perception of illness, creatinine level and cognitive depression.

Thus by addressing illness intrusiveness, one can work towards reducing the creatinine level and thereby improve the patients' overall health status. It is suggested that appropriate psychological interventions can be designed and administered among the ESRD patients periodically to reduce the level of illness intrusiveness to some extent which may likely to benefit them to reduce the creatinine level in their body. .

Depression was also noted to have a significant effect on increasing the level of creatinine. It is noted that with the increase in depression, the level of creatinine in the blood also increases correspondingly. This factor is a

negative outcome for individuals on dialysis. Increases in creatinine poses a great risk for the survival of patients with ESRD. The special thrust must be paid to regulate the depression level at manageable level which may help in restoring the balance in the level of creatinine in the blood, the rational being that depressed individuals tend to ignore treatment regimen as they have lack of interest and motivation to look forward to future outcomes in life. Chen et al (2010) in their study has noted that depression was associated with low nutrition and increasing the number of comorbid physical illness, and that depression and anxiety are robust indicators of suicidal ideations in ESRD patients. Cukor et al (2008) used creatinine to establish base line to test effect of depression and anxiety in ESRD patients, hence it is an important marker that relates to identifying health status of the patients. Thus is supportive of the findings of the current study where by depression an be used as an indicator for identifying both psychological health and were by addressing physiological parameters in ESRD patients on dialysis specific to creatinine. Sack, Peterson & Kimmel (1990) found that cognitive depression and creatinine level in ESRD and chronic renal insufficiency patients were strongly correlated in HD and CAPD.

In the current research outcome anxiety was noted to have no significant relationship with creatinine though past research studies have shown that anxiety tend to have an effect on creatinine level of ESRD patients who are undergoing hemodialysis. The study showed that an increase in anxiety also increases the level of creatinine which is not an effective out-come for hemodialysis patients. When anxiety level of the patient is increased, it tends to interfere with the health outcome of the patients undergoing dialysis, most particularly by increasing creatinine level in the blood which is one of the major risk factor for ESRD patients. It is suggested suitable psychological Intervention must be designed and administered to those ESRD patients specifically to address the anxiety levels which can aid in improving the health status of ESRD patients. Anxiety is known to have an effect on medical symptoms as emphasised by Katon, Lin and Kroenke (2007) where it was concluded that understanding anxiety can optimize management of somatic symptoms in medical conditions. Roy-Byrne et al (2007) also stated that anxiety does pose a risk in the outcome of the medical illness in the client.

IWG is more effectively addressed as the concept of fluid restriction in ESRD patients undergoing hemodialysis was found to be associated with illness intrusiveness. The major issue is that when an individual's knowledge about the illness and their perception of how much the illness interferes with their life is very much limited, it will certainly have much interference with their life style, particularly the quantum of fluid intake of the patient - i.e. he/ she will fail to follow the fluid restriction diet prescribed to them to meet the required standard. An increase in anxiety is also noted to be associated with the IWG, this may pertain to the fact that increased anxiety may make the individual indulge in fluid intake beyond their restricted level of intake. Further, it is noted that IWG very much depends on the ESRD patients control and ability to understand and work through their emotions. Unless IWG is strictly followed during their course of treatment, they will not be able to adhere to the treatment regimen of ESRD patients. Christensen & Ehlers (2002) found that when patients style of coping is contextual to the extent of renal intervention used in ESRD (dialysis), that is to say that the patient is able to understand the process and the illness factor of the renal replacement therapy; they tend to have a good adherence and adjustment to the treatment.

The present findings revealed that the depression level tend to have strong relationship with physical activity. The relationship expressed in such as way that when depression was increased, the corresponding physical activity tends to be low. Studies have shown that increased physical activity reduced the level of depression (Mi Rye Suh et al, 2002). The physical exercise in ESRD patients tends to improve their level of depression. Kosmadakis et al (2010) reviewed and noted that physical activity and exercise regimen is important aspect that has to be included in the treatment regimen of ESRD patients.

Depression and anxiety have noted to have significant relationship with each other, as it's a known theory that they tend to be comorbid factors in general and also in association with chronic medical conditions. Among ESRD patients who are undergoing hemodialysis, the comorbid condition of depression and anxiety has been commonly noted. This is supported by the findings of Cukor et al (2008) who observed that depression and anxiety as comorbid psychiatric diagnosis in hemodialysis patients. Katon, Lin & Kroenke (2007) found that anxiety and depression corm comorbid factors in chronic medical conditions.

IWG was noted to be associated with illness intrusiveness. The individual's perception of illness will lead to his or her maintenance on a fluid restriction. Hardly any research studies exists addressing the specific issues as to how ones IWG increases in relation to one's health belief/ illness intrusiveness. Though Illness intrusiveness has been associated with anxiety and depression, the research evidence suggested that the increased illness perception puts hamodialysis patients at high risk for depression and anxiety as evaluated by Yildirim et al (2013). Everette et al (1995) and García et al (2001) has linked IWG to depression and stress which has serious health consequences i.e.

increased depression leads to increased IWG where by increasing high level of risk among ESRD patients. Durose et al (2004) studied the knowledge of dietary restriction and medical consequences of hemodialysi patients and reported that patients with better knowledge were more compliant to dietary restrictions. The knowledge level of Illness intrusiveness changes accordingly due to the amount of information the client/patient has regarding ones illness. Hence, it is desirable to educate the patients through various means and methods to acquire knowledge about the requirements, which can in turn improve better maintenance of IWG.

Anxiety has been a part of clinical conditions in chronic illness, it is also noted to play a major factor that exist comorbid with depression in ESRD. The study showed that there is positive relationship between anxiety and IWG, that is, the increased level of anxiety is likely to increase IWG in ESRD patients. Cukor et al (2008) identified anxiety and depression as major additional factors in ESRD patients on hemodialysis. Further, it was supported by the research studies of Karamanidou et al (2007). Khalil et al (2011) identified the level of depression to be major factor in fluid and dietary adherence in patients of ESRD. Depression was associated with poor fluid and dietary adherence. Thus anxiety may be also included as a major factor in IWG maintenance in ESRD patients on Hemodialysis.

Physical activity was also known to be associated with creatinine as increase in physical activity of the individuals undergoing hemodialysis tends to reduce the creatinine level. This pertains to the fact that routine physical activity denotes an individual with sound mental health. If it becomes a regular routine in their day-to-day functioning, one can have a very healthy out-come both physically and mentally. Beddhu et al (2009) noted that increased physical activity can have more survival benefits in ESRD. Johansen et al (2000) found that there exist a correlation between serum albumin and creatinine level with that of physical activity in ESRD patients.

The finding also identified that QOL-P is associated with anxiety, it can be inferred that when anxiety level increased, the overall QOL-P also increased correspondingly i.e. to say that an increase in anxiety keeps in check the QOL-P in ESRD patients who are undergoing hemodialysis. This can be due to the fact that one need to function better to take care of one self and others and also the demand to function in the context of the individual's role as well as for others. The patients need to have QOL-P is important for survival, though the illness and anxious not wanting to break protocol in relation to physiological factors. This may be supported with the findings of Paraskevi (2011) which assessed anxiety and depression with QOL of ESRD patients where he found that Illness related factors were associated with QOL and also mental health status, where he had addressed both anxiety and depression. As identified by Cukor et al (2008) and DiMatte, Lepper &Croghan (2004) the co morbid factor of anxiety and depression in ESRD patients and their impact can supportive of the findings of Cengic and Resic (2010) who described depression as the most common complication in hemodialyis patients and its results in poor QOL.

The evaluation of how the key variables of the study interacting with the sub scales of QOL-P and QOL-H of KDQOL-SF indicated that Serum albumin was noted to be associated with social support; this may be due to the fact that when serum albumin increases the individuals diet has improved. This showed that the patients started receiving support in improving his/her QOL-P life than in relation to addressing QOL-H there exists a pressure in doing so. In simple terms, the patients are forced to maintain physical health with less regard or leaving behind the aspects of QOL-H. This is supportive of the fact that physical status is given more importance than the actual health (mental) status of the individual. The finding can be assumed with the associated with the fact that Serum albumin level is related to quality of life health relating to physical functioning. This may attribute to the fact that the reduction in physical functioning leads to an increased accumulation of proteins in the body, for ESRD patients need for increased serum albumin is important though the utilization factor of the protein is not enforced while measuring the level of serum albumin. Though the lack of physical activity has poor psychological out come in hemodialysis patients. In past researches there has been no directly association of quality of life with serum albumin level, but the idea of better maintenance on dialysis and improving health and well-being has been noted as in by Jhamb et al (2011), MahboobLessan & Zohreh (2009). where poor health related quality of life that is associated with poor health outcome and unless attention is given to psychosocial and medical intervention. The concept of depression being associated with serum albumin in ESRD by Friend et al (1997) where it influenced nutritional level and increased depression leads to reduced serum albumin, increased risk of mortality and further supported the findings of Cukor et al (2014) where in depression and QOL were assessed together in addressing improvement of depression and QOL.

Furthermore there was also a relationship between physical activity and symptoms QOL-P. This highlights the fact that the increase in physical symptom improves the individuals quality of physical health by reducing the symptoms relating to ESRD patients. Li, Li & Fan (2010) found that physical activity can improve the QOL of ESRD patients.

Parson et al (2006) has shown that improvement of the dialysis efficacy leading to improved levels of QOL of ESRD patients under hemodialysis. IWG was also related ones' physical activity QOL-H level, the reduction in one physical activity very much effects and leads to the increase in IWG in patients, so it is safe to conclude that the improved physical activity pertaining to daily routine can help maintain IWG. There are numerous evidence suggested that physical activity is an important factor to be addressed and incorporated in to routine care as studied by Johansen (2007), Nanyama et al (2009) and Pearson et al (2006)

The finding also showed that anxiety was associated with sleep, the increase in anxiety is noted to reduce the level of sleep in individuals undergoing hemodialysis. The process of dialysis and the treatment process is bound to induce anxiety were by interfere with the individuals sleep pattern. There are no specific literature in relation to sleep and anxiety, but in general context sleep disturbance has been associated with anxiety and depression as discussed by Spoormaker & Bout (2005). Cukor et al (2008) had assessed that depression and anxiety is very much determinates of QOL in ESRD patients.

The study also evaluated the relationship between QOL-P and QOL –H and the findings revealed that symptoms of QOL-P and Pain QOL-H go hand in hand. An increased symptom can very much effect the quality of sleep in the patients undergoing hemodialysis. Burden of kidney disease QOL-P tend to have an effect on QOL-H Role physical, general health and fatigue when burden of kidney disease tends to worsen. This is very descriptive idea of the fact that when one is burdened of his/her kidney disease there is sure effect on their physical role in their daily happenings and their feeling of fatigue which there by affects their general physical health. The findings also overlay that one's work status increases their physical functioning which in turn puts a strain on one's physical status for those with employed jobs were by reducing the quality of life relating to their physical aspect. The cognitive functions improves ones physical role and energy level, cognitive function is based on how much of work or activity one does, with increased physical role that involves increased energy level. Sleep and emotional wellbeing both are connected improvement of sleep improves emotional well-being. It is well established fact in theory that sleep is an important part of ones' mental health and their emotional well-being. There are no graded literature addressing the various components of quality of life relating to ESRD patients but there are studies that addressed the QOL in ESRD patients. Shrestha et al (2008) assessed the dimensions of KDQOL-SF for ESRD patients, the findings showed that QOL-P is significantly correlated QOL-H and that there existed a positive correlation between the domains of KDQOL-SF. Diaconu (2010) noted that QOL effects both Physical and Mental health in ESRD patients. Perales-Montilla, García-León & Reyes-del Paso (2012). addressed that psychological intervention must focus on improving QOL. Paraskevi (2011) indicated that health belief in ESRD patients influences their QOL, MahboobLessan & Zohreh (2009). emphasized that poor QOL must be addressed by both psycho social medical intervention. Blake et al (2000) suggest that vocational rehabilitation of ESRD patients must consider physical function and occupational demands as well as co-morbidity and that musculoskeletal disease is key factor in impaired physical function, this may address the findings where work states and energy levels are correlated.

Illness intrusiveness depression anxiety and performance status of hemodialysis patients that were assessed by Pop-Jordanova & Polenakovic (2012) has shown hypersensitivity, depressed mood, interpersonal problems and reduced social interaction. Harris et al (2012), has addressed the importance of sleep and pain as key factors which can help improve QOL and more specifically on non-dialysis days. Joshwa, Khakha & Mahajan (2012) showed that fatigue, depression and sleep problems give poor QOL in maintaining hemodialysis patients. The importance of physical activity has been repeatedly addressed as important part of ESRD patients and it must be adopted as a routine aspect in treatment regimen as discussed by Kosmadakis et al (2010).

The regression analysis in the present study showed minimal scatter plots, but will very low R^2 value even if the F value is significant, this may indicate that the finding is of no value but as no research studies have been attempted, these findings cannot be ignored as there is no significance; it only showed that the effect size is reduced but this may in turn be addressed by future studies based on the current dimensions of the study. Grace - Martin (2012) has discussed regression value lower than 7% does not indicate that the findings need to be rejected, it states that it deepens on the area of study and also that human sciences indicates unpredictable data and hence larger sample size must be used. The fact of treatment modality differed between patients on hemodialysis as they were taken from different hospitals that have different treatment environment and regiment. Though the presence of linearity of the relationship between the significant variable enables one to look further in to the analysis of the psychological and physiological variables associated with ESRD patients undergoing hemodialysis is a factor exploring and further understanding of the interaction and the role each variable plays in bringing about effective health outcome.

CHAPTER 5 SUMMARY CONCLUSIONS

4.1 Introduction

The descriptive survey research design of the study examines the nature of psychological factors and its relation to physical factors in hemodialysis patients. The sample is collected by using purposive sampling. The study sample was collected from hospitals and dialysis clinics in and around Chennai who offer hemodialysis as renal replacement therapy. A total of 155 patients were approached of which, a sample of 127 was taken, 14 of the patients were unable to complete the assessment (due to physical discomfort), 6 patients dropped out from the study and 8 patiens did not follow up for the second session of assessment.

The patients were approached individually and the proper explanation on the purpose of the study, implications of the study was narrated duly with proper clarification. Once the patiens were convinced, the informed consent to participate in the research study was obtained. The Socio demographic details of the patients were collected. They were checked for inclusion and exclusion criteria. Based on the scores obtained in GHQ, the patients were included once they met the required specification. Only those who are qualified to meet the requirements were included in the present study. They were then administered the following tests: Becks Depression Inventory II, Becks Anxiety Inventory, Adaptive Illness Intrusiveness rating scale, Kidney Disease Quality of Life Questionnaire-Short Form and Karnofsky performance status scale

4.2 The Findings

1. Serum albumen level is noted to increase when the anxiety level of the patient is low, this is indicative of the fact that if one works on reducing the anxiety of ESRD patients, an HD will improve the serum albumin level there by tend to have better medical health.
2. Increase in illness intrusiveness tend to increase that level of creatinine which showed that when the patients have increased illness intrusive thought which may likely to increase the level of creatinine that has a negative effect on the overall medical health of the patient as patients are urged to maintain a low creatinine level.
3. Increase in depression is noted to be related to the increased level of creatinine in the blood. This factor is a negative outcome for individuals on dialysis. Increases creatinine poses a risk factor for survival of individuals with ESRD
4. An increase in illness intrusiveness and anxiety is noted to increase the level of Interdialytic Weight Gain (IWG), thus addressing anxiety and illness intrusiveness can reduce IWG which is major risk factor of individuals undergoing hemodialysis.
5. Depression was noted to have an effect on the physical activity. Depression is seen to reduce the level of physical activity.
6. Physical activity is noted to have a significant effect on the level of creatinine in the blood. An reduction in physical activity tend to increase creatinine level which is at great risk. So, by improving physical activity one can address the issues of Increased creatinine level
7. Quality of Life physical is noted to be related to anxiety levels among ESRD patients. Increased anxiety tends to reduce the quality of physical aspect among ESRD patients on haemolysis.
8. There is significant correlation between depression and anxiety in ESRD patients and it is noted that an increase in depression tend to increase the level of anxiety for patients on hemodialysis.
9. Quality of Life – Physical Social support is related to Serum albumin level in patients. An increase in serum albumin level tend to reduce the need for social support.
10. Quality of Life – Physical Symptom is related to physical activity. It is noted that increased physical activity reduces the symptoms of ESRD on Hemodialysis.
11. Quality of Life- Health Physical function is related to Serum albumin. The increase in physical functioning tends to reduce the serum albumin level as patients pay less attention to their health outcome.
12. Quality of Life – Health Role physical is related to IWG. The increase in the role physical of the individual leads to reduction of IWG which indicates that an health out come is related to good physical activity.
13. QOL-P symptoms is correlated with QOL-H pain. This indicated that an increase in the patient's symptoms relating to QOL-P significantly effects QOL-H pain by increasing pain related to health.
14. Burden of Kidney related in QOL-P is noted to be correlated with QOL-H Role physical, General health and Energy / fatigue; An increase in the burden of kidney in QOL-P leads to an increase in QOL-H relating to the health aspects of role physical, general health and energy/fatigue.

15. QOL-P Work status and QOL-H to physical functioning are correlated. An increase in the physical demand of work among ESRD patients on HD tend to reduce their QOL-H physical function.
16. QOL- P Cognitive Function is QOL-H role physical and energy/ fatigue, this has indicated that the reduction in one's cognitive functioning in daily tasks can lead an increase individual straining were by there will be increased effect of one's role physical and energy/fatigue.
17. QOL-P Social Interaction is related to QOL-H pain and energy / fatigue. Increased social interaction can reduce the level of pain experienced by the patient and also reduction in QOL-H relating to fatigue.
18. QOL-P Sleep is directly related to QOL-H emotional wellbeing. Increase in sleep tends to increase the emotional wellbeing of patients undergoing hemodialysis.
19. Linear regression analysis was done for key variables that were found to have significant level of correlation; Serum albumin and anxiety; Creatinine and physical activity; Creatinine and illness intrusiveness; creatinine and depression; IWG and illness intrusiveness; IWG and anxiety; anxiety and QOL-P; depression and anxiety. The findings have shown that linear regression exists among the variables tested.
20. The test findings have failed to indicate low R^2level, though there still exists a relationship that is linear and the low R^2 value is primarily due to reduced effect size.

4.3 Conclusion

Studies relating to physiological and psychological factors are not extensively looked into more specific in identifying the mind body relationship in treatment protocol for ESRD patients. The present study has highlighted on the effect of physiological factors of Serum Albumin, Creatinine, IWG and KPS are in fact influence by psychological aspects such as depression, anxiety and illness intrusiveness. As previous studies have also depicted, that QOL does play a vital aspect in indicating ones psychological and also physiological decline in the health. The evidence to work on this aspect is an extensive task specific to the Indian context, as there is marked change in how the treatment protocol is followed and also the accessibility to treatment aspects and also the monitory aspects relating to the same. It is important that one may have to work on building integrated care, both psycho social and medical management must be combined for the better outcome in ESRD patients on hemodialysis.

The implication of the current study is to pave the way of addressing ESRD patients on hemodialysis and may even move in to CAPD patients. Further studies can focus more in to domains in QOL of kidney diseases and further more in to how they are effected by psychological and more importantly the physiological factors that are key in the health status of ESRD patients. The major implication is the development of an integrated approach to the treatment of ESRD patients in hemodialysis. There are still major aspects, factors and comorbidities in ESRD patients that are to be explored and worked on to improve treatment aspects and follow through in betterment of ESRD patients QOL.

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Glossary

1. **Acute Renal failure (ARF):** Acute renal failure (ARF) is an abrupt loss of kidney function that develops within 7 days. Acute renal failure develops rapidly over a few hours or days. It may be fatal. It's most common in those who are critically ill and already hospitalised.

2. **Amino acid:** Amino acids are the structural units (monomers) that make up proteins. They join together to form short polymer chains called peptides or longer chains called either polypeptides or proteins

3. **Anemia:** A condition in which there is a deficiency of red cells or of haemoglobin in the blood, resulting in pallor and weariness.

4. **Anxiety:** A mental health disorder characterised by feelings of worry, anxiety or fear that are strong enough to interfere with one's daily activities.

5. **Behaviour** : Behaviour or behaviour is the range of actions and mannerisms made by individuals, organisms, systems, or artificial entities in conjunction with themselves or their environment, which includes the other systems or organisms around as well as the (inanimate) physical environment. It is the response of the system or organism to various stimuli or inputs, whether internal or external, conscious or subconscious, overt or covert, and voluntary or involuntary.

6. **Chronic ambulatory peritoneal dialysis (CAPD):** CAPD is the most portable type of dialysis. It uses manual bags containing peritoneal dialysis fluid. It is done every day, via your peritoneal cavity, with bag changes four times a day. It can usually be learnt in about a week and does not require needles.

7. **Chronic illness:** A chronic Illness is a human health condition or disease that is persistent or otherwise long-lasting in its effects or a disease that comes with time. The term chronic is often applied when the course of the disease lasts for more than three months.

8. **Chronic Renal Failure (CRF):** Chronic renal failure, or chronic kidney disease (CKD), is a slow and progressive decline of kidney function.

9. **Creatine:** Creatine is a nitrogenous organic acid that occurs naturally in vertebrates. Its main role is to facilitate recycling of adenosine triphosphate (ATP), the energy currency of the cell, primarily in muscle and brain tissue.

10. **Creatinine:** Creatinine a compound which is produced by metabolism of creatine and excreted in the urine.

11. **Compliance:** Compliance means conforming to a rule, such as a specification, policy, standard or law. Regulatory compliance describes the goal that organizations aspire to achieve in their efforts to ensure that they are aware of and take steps to comply with relevant laws, policies, and regulations.

12. **Dependent variable:** A dependent variable is what you measure in the experiment and what is affected during the experiment. The dependent variable responds to the independent variable. It is called dependent because it "depends" on the independent variable. In a scientific experiment, you cannot have a dependent variable without an independent variable.

13. **Diabetic nephrology:** High blood glucose, also called blood sugar, can damage the blood vessels in your kidneys. When the blood vessels are damaged, they don't work as well. Many people with diabetes also develop high blood pressure, which can also damage your kidneys.

14. **Dialysis:** Dialysis is the process of removing excess water, solutes and toxins from the blood in those whose native kidneys have lost the ability to perform these functions in a natural way. This is referred to as renal replacement therapy.

15. **Dietary Restrictions:** Dietary restriction (DR) is a robust no genetic, nonpharmacological intervention that is known to increase active and healthy lifespan in a variety of species.

16. **Direct intrusiveness:** Direct intrusiveness is introduced by the physiological effect of the illness

17. **End stage Renal Disease (ESRD):** End-stage kidney disease is also called end-stage renal disease (ESRD). The kidneys of people with ESRD function below 10 percent of their normal ability, which may mean they’re barely functioning or not functioning at all.

18. **Haemodialysis:** Haemodialysis, also spelled haemodialysis, commonly called kidney dialysis or simply dialysis, is a process of purifying the blood of a person whose kidneys are not working normally

19. **Health:** Health is the level of functional and metabolic efficiency of a living organism.

20. **Hypertension:** A condition in which the force of the blood against the artery walls is too high.

21. **Hyperkalaemia:** Hyperkalaemia is the medical term that describes a potassium level in your blood that's higher than normal. Potassium is a chemical that is critical to the function of nerve and muscle cells, including those in your heart.

22. **Illness intrusiveness:** Illness intrusiveness is a common, underlying determinant of quality of life in people affected by chronic disease. Illness intrusiveness results from disease- and treatment-induced disruptions to lifestyles, activities, and interests (i.e., interference with psychologically meaningful activity).

23. **Independent variable:** An independent variable is a variable that is manipulated to determine the value of dependent variables.

24. **Indirect intrusiveness:** Indirect intrusiveness interference in the family relationship and friendship patterns are disrupted and affected.

25. **Inter dialytic Weight gain:** Intradialytic weight gain (IWG) is an easily measurable parameter in the dialysis unit, routinely assessed at the beginning of the dialysis session.

26. **Immunosuppression:** Immunosuppression is a reduction of the activation or efficacy of the immune system. Some portions of the immune system itself have immunosuppressive effects on other parts of the immune system, and immunosuppression may occur as an adverse reaction to treatment of other conditions.

27. **Kidney:** The kidneys are two bean-shaped organs found on the left and right sides of the body in vertebrates. They are located at the back of the abdominal cavity in the retroperitoneal space.

28. **Kidney disease:** Longstanding disease of the kidneys leading to renal failure.

29. **Malnutrition:** Lack of sufficient nutrients in the body.

30. **Neurology:** Neurology is a branch of medicine dealing with disorders of the nervous system. Neurology deals with the diagnosis and treatment of all categories of conditions and disease involving the central and peripheral nervous systems

31. **Neuro-behavioural:** Behavioural neurology is a subspecialty of neurology that studies the neurological basis of behaviour, memory, and cognition, the impact of neurological damage and disease upon these functions, and the treatment thereof.

32. **Pain:** Pain is a highly unpleasant physical sensation caused by illness or injury.

33. **Perceived:** Perceived is to become aware or conscious of (something); come to realize or understand.

34. **Perceived Health Risk:** Perceived health risk is inherently multidimensional, with many characteristics other than the probability of harm affecting human judgement. How ‘risky’ an exposure or behaviour is perceived to be by a given individual depends on a long list of factors, including whether the risk is perceived to be voluntary, familiar, amenable to easy change, associated with benefits, and associated with immediate or short-term versus delayed or long-term impacts.

35. **Peritoneal Dialysis:** Peritoneal dialysis is a type of dialysis that uses the peritoneum in a person's abdomen as the membrane through which fluid and dissolved substances are exchanged with the blood.

36. **Physical performance:** Physical performance is mainly a function of an individual’s size, shape, sex, and age, but not entirely so. Success in sport at whatever level also depends on fitness. It is assumed, of course, that implicit in any definition of fitness is the absence of acute or chronic illness.

37. **Psychology:** Psychology is the science of behaviour and mind, including conscious and unconscious phenomena, as well as thought.

38. **Physiology:** Physiology is the scientific study of normal mechanisms, and their interactions, which works within a living system.

39. **Psycho-nephrology:** Psycho-nephrology is the psychosocial management of patients with chronic kidney diseases

40. **Psychopathology:** Psychopathology is the scientific study of mental disorders, including efforts to understand their genetic, biological, psychological, and social causes.

41. **Psycho social factors:** A psychosocial factor is any exposure that may influence a physical health outcome through a psychological mechanism.

42. **Quality of Life (QoL):** Quality of life is the general well-being of individuals and societies, outlining negative and positive features of life.

43. **Regression:** In statistical modelling, regression analysis is a set of statistical processes for estimating the relationships among variables.

44. **Renal Functioning:** Renal function, in nephrology, is an indication of the kidney's condition and its role in renal physiology. Glomerular filtration rate (GFR) describes the flow rate of filtered fluid through the kidney.

45. **Renal Replacement Therapy (RRT):** Renal replacement therapy is therapy that replaces the normal blood-filtering function of the kidneys. It is used when the kidneys are not working well, which is called renal failure and includes acute kidney injury and chronic kidney disease.

46. **Sample design:** A sample design is made up of two elements. Sampling method. Sampling method refers to the rules and procedures by which some elements of the population are included in the sample.

47. **Self-Care:** Self-care is any necessary human regulatory function which is under individual control, deliberate and self-initiated. Some place self-care on a continuum with health care providers at the opposite end to self-care.

48. **Social Support:** Social support is the perception and actuality that one is cared for, has assistance available from other people, and that one is part of a supportive social network.

49. **Serum Albumin:** Human serum albumin is the serum albumin found in human blood. It is the most abundant protein in human blood plasma; it constitutes about half of serum protein. It is produced in the liver. It is soluble and monomeric.

50. **Urinemic:** A toxic condition resulting from kidney disease in which there is retention in the bloodstream of waste products normally excreted in the urine.