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Dialysis Treatment: A Comprehensive Description

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Abstract
The kidneys are a pair of vital organs that perform many functions to keep the blood clean and chemically balanced. The two most common causes of kidney disease are diabetes and high blood pressure. The National Kidney Foundation recommends three simple tests to screen for kidney disease: a blood pressure measurement, a spot check for protein or albumin in the urine, and a calculation of glomerular filtration rate based on a serum creatinine measurement. It is estimated that about 1, 00,000 persons suffer from ESRD each year of which only about 20,000 get treated. Dialysis is a process for removing waste and excess water from the blood. It is used primarily to provide an artificial replacement for lost kidney function in people with renal failure. There are benefits and complications for each type of dialysis. Attention paid by the primary health care systems to combat the rising epidemic of chronic diseases has been inadequate. This review provides the epidemiological data which helps the healthcare system to guide strategies for the prevention of kidney disease and planning for the provision of renal replacement therapy. Kidney diseases are highly prevalent globally. The risk factors for prevalence and incidence of haemodialysis are majorly hypertension and diabetes mellitus. Awareness of haemodialysis patients on the disease, medication, diet along with the life style modifications through the patient education was found to be very helpful for the patients to control their risk factors and to improve the compliance to the dosage regimen.

Key words: *Epidemiology, End stage renal disease, Haemodialysis, Renal function, Treatment*

Introduction
The kidneys are a pair of vital organs that perform many functions to keep the blood clean and chemically balanced. The kidneys are bean-shaped organs, each about the size of a fist. They are located near the middle of the back, just below the rib cage, one on each side of the spine. The kidneys are sophisticated reprocessing machines. Kidneys process about 200 quarts of blood to sift out about 2 quarts of waste products and extra water per a day. The wastes and extra water become urine, which flows to the bladder through tubes called ureters. The bladder stores urine until releasing it through urination. In the nephron (left), tiny blood vessels intertwine with urine-collecting tubes. Each kidney contains about 1 million nephrons.[1]

Functions of kidney
The kidney participates in whole-body homeostasis, regulating acid-base balance, electrolyte concentrations, extracellular fluid volume, and regulation of blood pressure. The kidney accomplishes these homeostatic functions both independently and in concert with other organs, particularly those of the endocrine system. Various endocrine hormones coordinate these endocrine functions; these include renin, angiotensin II, aldosterone, antidiuretic hormone, and atrial natriuretic peptide, among others. Many of the kidney's functions are accomplished by relatively simple mechanisms of filtration, reabsorption, and secretion, which take place in the nephron. Filtration, which takes place at the renal corpuscle, is the process by which cells and large proteins are filtered from the blood to make an ultra filtrate that eventually becomes urine. The kidney generates 180 liters of filtrate a day, while reabsorbing a large percentage, allowing for the generation of only approximately 2 liters of urine. Reabsorption is the transport of molecules from this ultrafiltrate and into the blood. Secretion is the reverse process, in which molecules are transported in the opposite direction, from the blood into the urine.

- Excretion of wastes
- Reabsorption of vital nutrients
- Acid-base homeostasis
- Osmolality regulation
- Blood pressure regulation
- Hormone secretion [2]

Renal Function

Renal function indicates how efficiently the kidneys filter blood. The two healthy kidneys have 100 percent of kidney function. Small or mild declines in kidney function-as much as 30 to 40% would rarely be noticeable. Kidney function is now calculated using a blood sample and a formula to find the estimated glomerular filtration rate (eGFR). The eGFR corresponds to the percent of kidney function available. For many people with reduced kidney function, a kidney disease is also present and will get worse. Serious health problems occur when people have less than 25 percent of their kidney function. When kidney function drops below 10 to 15 percent, a person needs some form of renal replacement therapy either blood-cleansing treatments called dialysis or a kidney transplant-to sustain life.[1]

The kidney function is estimated by calculating the following parameters

A. Filtration Fraction: The filtration fraction is the amount of plasma which is actually filtered through the kidney. This can be defined using the equation:

$$FF = GFR/RPF$$

FF is the filtration fraction, GFR is the glomerular filtration rate and RPF is the renal plasma flow. Normal human FF is 20%.

B. Renal Clearance: Renal clearance is the volume of plasma from which the substance is completely cleared from the blood per unit time.

$$C_X = (U_X)V/P_X$$

C_x is the clearance of X (normally in units of mL/min), U_x is the urine concentration of X, P_x is the plasma concentration of X and V is the urine flow rate.[3]

Kidney Failure

Renal failure (also kidney failure or renal insufficiency) is a medical condition in which the kidneys fail to adequately filter waste products from the blood. The two main forms are acute kidney injury, which is often reversible with adequate treatment, and chronic kidney disease, which is often not reversible. In both cases, there is usually an underlying cause. Most kidney diseases attack the nephrons, causing them to lose their filtering capacity. Damage to the nephrons can happen quickly, often as the result of injury or poisoning. But most kidney diseases destroy the nephrons slowly and silently. Only after years or even decades will the damage become apparent. Most kidney diseases attack both kidneys simultaneously. Renal failure is mainly determined by a decrease in glomerular filtration rate, the rate at which blood is filtered in the glomeruli of the kidney. This is detected by a decrease in or absence of urine production or determination of waste products (creatinine or urea) in the blood. Depending on the cause, hematuria (blood loss in the urine) and proteinuria (protein loss in the urine) may be noted.In renal failure, there may be problems with increased fluid in the body (leading to swelling), increased acid levels, raised levels of potassium, decreased levels of calcium, increased levels of phosphate, and in later stages anemia. Bone health may also be affected. Long-term kidney problems are associated with an increased risk of cardiovascular disease.

Classification: Renal failure can be categorized as following;

A. Acute kidney injury

B. Chronic kidney disease

C. End stage renal disease

D. Acute –on- Chronic renal failure

A. Acute kidney injury: Acute kidney injury (AKI), previously called acute renal failure (ARF), is a rapidly progressive loss of renal function, generally characterized by oliguria (decreased urine production, quantified as less than 400 mL per day in adults, less than 0.5 mL/kg/h in children or less than 1 mL/kg/h in infants); and fluid and electrolyte imbalance. AKI can result from a variety of causes, generally classified as prerenal, intrinsic, and postrenal. The underlying cause must be identified and treated to arrest the progress, and dialysis may be necessary to bridge the time gap required for treating these fundamental causes.

B. Chronic kidney disease: Chronic kidney disease (CKD) can also develop slowly and, initially, show few symptoms. CKD can be the long term consequence of irreversible acute disease or part of a disease progression. Most kidney problems, however, happen slowly. A person may have "silent" kidney disease for years. Gradual loss of kidney function is called chronic kidney disease (CKD) or chronic renal insufficiency. People with CKD may go on to develop permanent kidney failure. They also have a high risk of death from a stroke or heart attack.

C. End-stage Renal Disease: Total or nearly total and permanent kidney failure is called end-stage renal disease (ESRD).[1]ESRD usually results from a progressive and irreversible loss of renal function and is defined by a glomerular filtration rate (GFR)

of less than 15 ml/min. People with ESRD must undergo dialysis or transplantation to stay alive.[14]

D. Acute-on-chronic renal failure: Acute kidney injuries can be present on top of chronic kidney disease, a condition called acute-on-chronic renal failure (AoCRF). The acute part of AoCRF may be reversible, and the goal of treatment, as with AKI, is to return the patient to baseline renal function, typically measured by serum creatinine. Like AKI, AoCRF can be difficult to distinguish from chronic kidney disease if the patient has not been monitored by a physician and no baseline (i.e., past) blood work is available for comparison.

Causes of Kidney Failure

Many factors that influence the speed of kidney failure are not completely understood. Researchers are still studying how protein in the diet and cholesterol levels in the blood affect kidney function. The two most common causes of kidney disease are diabetes and high blood pressure. People with a family history of any kind of kidney problem are also at risk for kidney disease.

1. Diabetic Kidney Disease: Diabetes is a chronic metabolic disorder in which the glucose metabolism is impaired. High blood glucose levels can damage the nephrons progressing to the diabetic kidney disease. Proper control on blood glucose levels can delay or prevent diabetic kidney disease. Individuals with type 1 diabetes mellitus have a 40% lifetime risk of developing CKD, while individuals with type 2 diabetes mellitus have a 50% lifetime risk.

2. High Blood Pressure: Hypertension is both a common result and a frequent cause of chronic kidney disease. Hypertension generally develops concomitantly with progressive kidney disease. High blood pressure can damage the small blood vessels in the kidneys. The damaged vessels cannot filter wastes from the blood as they are supposed to. For example, at a GFR of 90 mL/min per 1.73m2, 40% of individuals have hypertension; at a GFR of 60 mL/min per 1.73 m2, 55% have hypertension; and at a GFR of 30 mL/min per 1.73m2, over 75% have hypertension. The National Heart, Lung, and Blood Institute (NHLBI), one of the National Institutes of Health ,recommends that people with diabetes or reduced kidney function keep their blood pressure below 130/80 mmHg.

3. Glomerular Diseases: Several types of kidney disease are grouped together under this category, including autoimmune diseases, infection-related diseases, and sclerotic diseases. As the name indicates, glomerular diseases attack the tiny blood vessels, or glomeruli, within the kidney. The most common primary glomerular diseases include membranous nephropathy, IgA nephropathy, and focal segmental glomerulosclerosis.

4. Genetic predisposition: The APOL1 gene has been proposed as a major genetic risk locus for a spectrum of non-diabetic renal failure in individuals of African origin, these include HIV-associated nephropathy (HIVAN), primary non-monogenic forms of focal segmental glomerulosclerosis, and hypertension affiliated chronic kidney disease not attributed to other etiologies. Two western African variants in APOL1 have been shown to be associated with end stage kidney disease in African Americans and Hispanic Americans.

5. Inherited and Congenital Kidney Diseases: Some kidney diseases result from hereditary factors. Polycystic kidney disease (PKD), for example, is a genetic disorder in which many cysts grow in the kidneys. PKD cysts can slowly replace much of the mass of the kidneys, reducing kidney function and leading to kidney failure. Some kidney problems may show up when a child is still developing in the womb. Examples include autosomal recessive PKD, a rare form of PKD, and other developmental problems that interfere with the normal formation of the nephrons. Some hereditary kidney diseases may not be detected until adulthood. The most common form of PKD was once called "adult PKD" because the symptoms of high blood pressure and renal failure usually do not occur until patients are in their twenties or thirties.

6. Other Causes of Kidney Disease: Poisons and trauma, such as a direct and forceful blow to the kidneys, can lead to kidney disease. Some over-the-counter medicines can be poisonous to the kidneys if taken regularly over a long period of time

Signs and Symptoms It can vary from person to person. Someone in early stage kidney disease may not feel sick or notice symptoms as they occur. When kidneys fail to filter properly, waste accumulates in the blood and the body, a condition called azotemia. Very low levels of azotaemia may produce few, if any, symptoms. If the disease progresses, symptoms become noticeable (If the failure is of sufficient degree to cause symptoms).

Symptoms of kidney failure include:

Uraemia: Vomiting and/or diarrheawhich may lead to dehydration, nausea, weight loss, nocturia, polyuria or oliguria, hematuria and dysuria.

Hyper Phosphatemia: Itching**,** bone damage**,** bone fractures and muscle cramps (caused by low levels of calcium which can be associated with hyperphosphatemia)

Hyperkalemia: Arrhythmias and muscular paralysis

Edema of the body: Swelling of the legs, ankles, feet, face and/or hands**,** SOB due to extra fluid on the lungs (may also be caused by anemia).
Polycystic kidney: It shows large, fluid-filled cysts on the kidneys and sometimes the liver can cause pain in the back or side.
Anaemia: Fatigue, dementia, dizziness and hypotension etc.
Proteinuria: Foamy urine, oedema of the hands, feet, abdomen or face
Other symptoms include: Anorexia, loss of taste sense, insomnia, Darkskin, Proteinemia and seizures may occur with high dose penicillin.

Diagnostic approach to detect kidney diseases
The National Kidney Foundation recommends three simple tests to screen for kidney disease: a blood pressure measurement, a spot check for protein or albumin in the urine, and a calculation of glomerular filtration rate (GFR) based on a serum creatinine measurement. Measuring urea nitrogen in the blood provides additional information.

Epidemiology of Acute kidney disease
New cases of AKI are unusual but not rare, affecting approximately 0.1% of the UK population per year (2000 ppm/year), 20times more for the incidence of new ESRD. AKI requiring dialysis (10% of these) is rare (200 ppm/year). An annual incidence of AKD world-wide is approximately 0.02%. Acute kidney injury is common among hospitalized patients. It affects some 3-7% of patients admitted to the hospital and approximately 25-30% of patients in the intensive care unit.[4] Recent studies in the United States and Spain have shown incidences varying between an average of 23.8 cases per 1000 discharges with an 11% yearly increase between 1992 and 2001, to an increase from 61 to 288 per 100,000 populations between 1988 and 2002. More recently, Ali *et al.* reported a high incidence of 1811 cases of AKI per million populations during 2003.[15]

Epidemiology of chronic kidney disease
Chronic kidney disease globally resulted in 735,000 deaths in 2010 up from 400,000 deaths in 1990.[5]In Canada 1.9 to 2.3 million people have chronic kidney disease. In the US, the Centers for Disease Control and Prevention found that CKD affected an estimated 16.8% of adults aged 20 years and older, during 1999 to 2004. UK estimates suggest that 8.8% of the population of Great Britain and Northern Ireland have symptomatic CKD.[6]Over 1 million people worldwide are alive on dialysis or with a functioning graft. Incidence of CKD has doubled in the last 15 years. In the USA, ~30 million people suffer from CKD and by 2010,>600 000 patients will require renal replacement therapy, costing US$28 billion .Risk factors for developing CKD differ between races and countries.[15]

Renal care Scenario in India
It is estimated that about 1, 00,000 persons suffer from ESRD each year of which only about 20,000 get treated. Over three-fourths of the people suffering from ESRD do not get treated well. Affordability is hampered by low incomes, low reimbursement for chronic illnesses and low penetration of insurance. This is unique to India as most other countries in Asia reimburse a large proportion of a patient spent on dialysis through social welfare means. Mean average age of ESRD patients in India is between 32 to 42 years comparing to 60 to 63 years in developed countries the major contributing factors are diabetes and cardiovascular diseases. Renal transplant in India is severely curtailed due to issues such as possible exploitation and cadaver program.[12, 13]

Management of complete renal failure
Total or nearly total and permanent kidney failure is called ESRD. If a person's kidneys stop working completely, the body fills with extra water and waste products. This condition is called uremia. Hands or feet may swell. A person will feel tired and weak because the body needs clean blood to function properly. Untreated uremia may lead to seizures or coma and will ultimately result in death. A person whose kidneys stop working completely will need to undergo dialysis or kidney transplantation.[8]

Transplantation
Renal transplantation remains the treatment of choice with end-stage renal failure, as relatively normal life style is usually re-established. However there is shortage of suitable organs of transplantations and up to 60% patients on dialysis program are not fit enough to undergo surgery and post-operative treatment. Except in those rare cases where genetically identical donor is available, the most important therapeutic aspect of transplantation is immunosuppressant to prevent rejection. The most disadvantage of immunosuppressive therapy is their non-specificity, in that they cause a general depression of the immune system. This exposes the patient to an increased risk of malignancy and infection which remains an important cause of morbidity and mortality.[16]

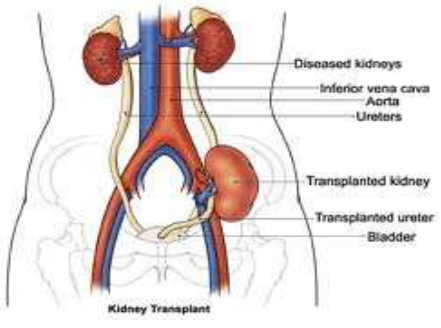

Figure 1- It shows the kidney transplantation[7]

Dialysis

Dialysis is a process for removing waste and excess water from the blood. It is used primarily to provide an artificial replacement for lost kidney function in people with renal failure. Dialysis is life-saving. Without it, patients whose kidneys no longer function would die relatively quickly due to electrolyte abnormalities and the buildup of toxins in the blood stream. Patients may live many years with dialysis but other underlying and associated illnesses often are the cause of death. There are majorly two types of dialysis; 1) Peritoneal dialysis and 2) Haemodialysis

1. Peritoneal dialysis

Peritoneal dialysis uses the lining of the abdominal cavity (peritoneum) as the dialysis filter to rid the body of waste and to balance electrolyte levels. A catheter is placed in the abdominal cavity through the abdominal wall and is expected to remain there for the long-term. The dialysis solution is then dripped in through the catheter and left in the abdominal cavity for a few hours and then is drained out. In that time, waste products leech from the blood normally flowing through the lining of the abdomen.[8]

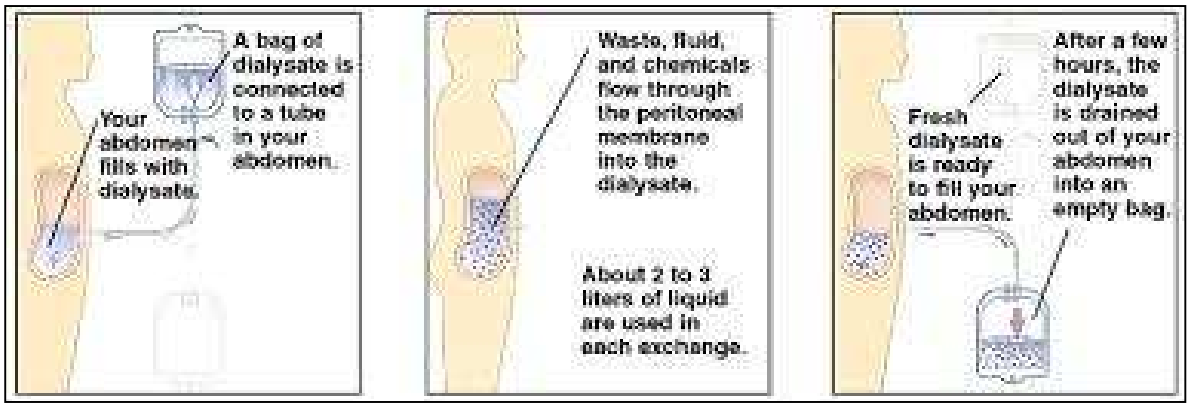

Figure 2- It displays the peritoneal dialysis[7]

2. Haemodialysis

Haemodialysis uses a machine filter called a dialyzer or artificial kidney to remove excess water and salt, to balance the other electrolytes in the body and to remove waste products of metabolism. Blood is removed from the body and flows through tubing into the machine, where it passes next to a filter membrane. A specialized chemical solution (dialysate) flows on the other side of the membrane. The dialysate is formulated to draw impurities from the blood through the filter membrane. Blood and dialysate never touch in the artificial kidney machine.[8]

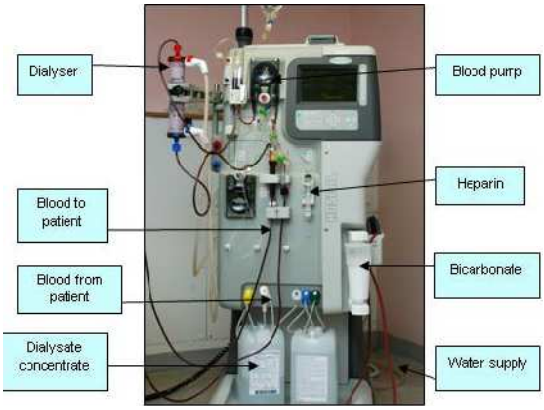

Figure 3- It shows the haemodialysis machine[14]

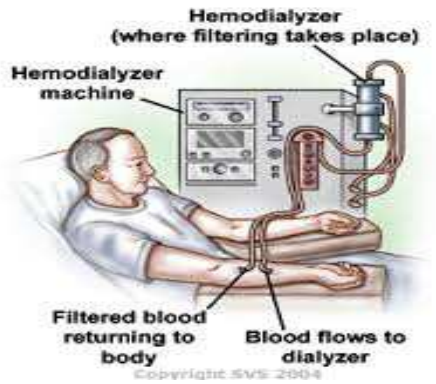

Figure 4- It shows the haemodialysis[9]

Principle of Haemodialysis

The principle of haemodialysis is the same as other methods of dialysis; it involves diffusion of solutes across a semi permeable membrane. Haemodialysis utilizes counter current flow, where the dialysate is flowing in the opposite direction to blood flow in the extracorporeal circuit. Counter-current flow maintains the concentration gradient across the membrane at a maximum and increases the efficiency of the dialysis.

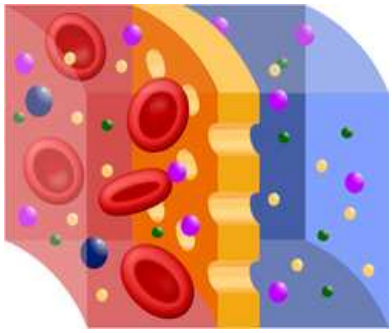

Figure 5- It shows the Semi-permeable membrane[9]

Fluid removal (ultrafiltration) is achieved by altering the hydrostatic pressure of the dialysate compartment, causing free water and some dissolved solutes to move across the membrane along a created pressure gradient. The dialysate (dialysis solution) is a sterilized solution of mineral ions or comply with British Pharmacopoeia. Urea and other waste products, potassium, and phosphate diffuse into the dialysis solution. However, concentrations of sodium and chloride are similar to those of normal plasma to prevent loss. Sodium bicarbonate is added in a higher concentration than plasma to correct blood acidity. A small amount of glucose is also commonly usedwhich is a different process to the related technique of hemofiltration. Haemodialysis can be an outpatient or inpatient therapy. Routine haemodialysis is conducted in a dialysis outpatient facility, either a purpose built room in a hospital or a dedicated, stand -alone clinic. Less frequently haemodialysis is done at home. Dialysis treatments in a clinic are initiated and managed by specialized staff made up of nurses and technicians; dialysis treatments at home can be self-initiated and managed or done jointly with the assistance of a trained helper who is usually a family member.[9]

Types of Haemodialysis There are three types of haemodialysis: conventional haemodialysis, daily haemodialysis, and nocturnal haemodialysis.

1. Conventional haemodialysis: Chronic haemodialysis is usually done three times per week, for about 3–4 hours for each treatment, during which the patient's blood is drawn out through a tube at a rate of 200-400 mL/min. The tube is connected to a 15, 16, or 17 gauge needle inserted in the dialysis fistula or graft, or connected to one port of a dialysis catheter. The blood is then pumped through the dialyzer, and then the processed blood is pumped back into the patient's bloodstream through another tube (connected to a second needle or port). During the procedure, the patient's blood pressure is closely monitored, and if it becomes low, or the patient develops any other signs of low blood volume such as nausea, the dialysis attendant can administer extra fluid through the machine. During the treatment, the patient's entire blood volume (about 5000 cc) circulates through the machine every 15 minutes. During this process, the dialysis patient is exposed to a week's worth of water for the average person.

2. Daily haemodialysis: Daily haemodialysis is typically used by those patients who do their own dialysis at home. It is less stressful (more gentle) but does require more frequent access. This is simple with catheters, but more problematic with fistulas or grafts. The "buttonhole technique" can be used for fistulas requiring frequent access. Daily haemodialysis is usually done for 2 hours six days a week.

***3. Nocturnal haemodialysis*:** The procedure of nocturnal haemodialysis is similar to conventional haemodialysis except it is performed three to six nights a week and between six and ten hours per session while the patient sleeps.[9]

Advantages of Haemodialysis

Low mortality rate, better control of blood pressure and abdominal cramps, less diet restriction, better solute clearance effect for the daily haemodialysis: better tolerance and fewer complications with more frequent dialysis**.**

Disadvantages of Haemodialysis

- Restricts independence, as people undergoing this procedure cannot travel around because of supplies' availability
- Requires more supplies such as high water quality and electricity
- Requires reliable technology like dialysis machines
- The procedure is complicated and requires that care givers have more knowledge
- Requires time to set up and clean dialysis machines, and expense with machines and associated staff.

Prescription for Haemodialysis

There are benefits and complications for each type of dialysis. The treatment decision depends on the patient's illness and their past medical history along with other issues. Usually, the nephrologists will have a long discussion with the patient and family to decide what will be the best option available. A prescription for dialysis by a nephrologist will specify various parameters for a dialysis treatment. These include frequency of dialysis, length of each treatment, and the blood and dialysis solution flow rates, as well as the size of the dialyzer. The composition of the dialysis solution is also sometimes adjusted in terms of its sodium and

potassium and bicarbonate levels. In general, the larger the body size of an individual, the more dialysis he/she will need. In North America and the UK, 3-4 hour treatments (sometimes up to 5 hours for larger patients) given 3 times a week are typical. Twice-a-week sessions are limited to patients who have a substantial residual kidney function. Four sessions per week are often prescribed for larger patients, as well as patients who have trouble with fluid overload. Finally, there is growing interest in short daily home haemodialysis, which is 1.5 - 4 hr sessions given 5-7 times per week, usually at home. There also is interest in nocturnal dialysis, which involves dialyze the patient, usually at home, for 8–10 hours per night, 3-6 nights per week. Nocturnal in-center dialysis, 3-4 times per week, is also offered at a handful of dialysis units in the United States.[9]

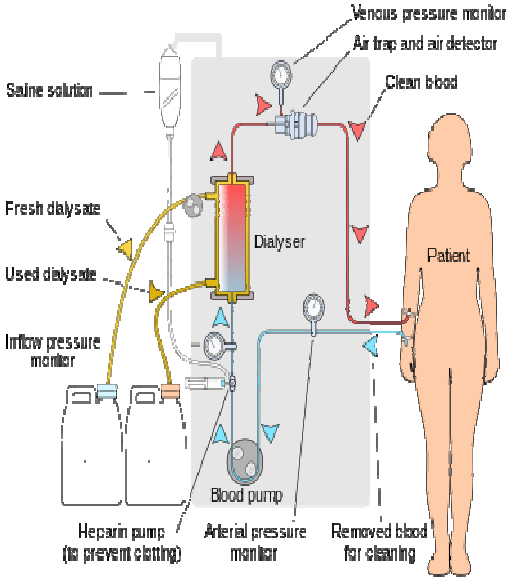

Figure 6- It displays the schematic representation of a haemodialysis circuit (Equipment)[9]

Complications of Haemodialysis

Haemodialysis often involves fluid removal (through ultrafiltration), because most patients with renal failure pass little or no urine. Side effects caused by removing too much fluid and/or removing fluid too rapidly include low blood pressure, fatigue, chest pains, leg-cramps, nausea and headaches. These symptoms can occur during the treatment and can persist post treatment; they are sometimes collectively referred to as the dialysis hangover or dialysis washout.

1. Intra dialysis complications

Hypoxemia -90% (5-30% sat. falls), Hypotension - 25 to 55 % of treatments, Cramps-5 to 20 %, Nausea and vomiting - 5 to 15 %, Headache-5%, Chest pain -2 to 5%, Back pain -2 to 5%, Itching -5%, Fever and chills - Less than 1%.

2. Post dialysis complications

Infections like HBV & HCV, disequilibrium syndrome, malnutrition, cardiac arrhythmias, haemorrhage, gastrointestinal effects, psychiatric illness (depression). The severity of these symptoms is usually proportionate to the amount and speed of fluid removal. However, the impact of a given amount or rate of fluid removal can vary greatly from person to person and day to day. These complications can be avoided and/or their severity lessened by limiting fluid intake between treatments or increasing the dose of dialysis e.g. dialyzing more often or longer per treatment than the standard three times a week, 3–4 hours per treatment schedule. Since haemodialysis requires access to the circulatory system, patients undergoing haemodialysis may expose their circulatory system to microbes, which can lead to sepsis, an infection affecting the heart valves (endocarditis) or an infection affecting the bones (osteomyelitis). The risk of infection varies depending on the type of access used .Bleeding may also occur; again the risk varies depending on the type of access used. Infections can be minimized by strictly adhering to infection control best practices.

Heparin is the most commonly used anticoagulant in haemodialysis, as it is generally well tolerated and can be quickly reversed with protamine sulfate. Heparin allergy can infrequently be a problem and can cause a low platelet count. In such patients, alternative anticoagulants can be used. In patients at high risk of bleeding, dialysis can be done without anticoagulation. First Use Syndrome is a rare but severe anaphylactic reaction to the artificial kidney. Its symptoms include sneezing, wheezing, shortness of breath, back pain, chest pain, or sudden death. It can be caused by residual sterilant in the artificial kidney or the material of the membrane itself. In recent years, the incidence of First Use Syndrome has decreased, due to an increased use of gamma irradiation, steam sterilization, or electron-beam radiation instead of chemical sterilants, and the development of new semi-permeable membranes of higher biocompatibility. For example, in 2008, a series of first-use type of reactions, including deaths occurred due to heparin contaminated during the manufacturing process with over sulfated chondroitin sulfate. Long term complications of haemodialysis include amyloidosis, neuropathy and various forms of heart disease. Increasing the frequency and length of treatments have been shown to improve fluid overload and enlargement of the heart that is commonly seen in such patients.[9]

Patient education

Patient counselling is defined as providing medication information orally or written form to the patients or his/her representative on directions of

use, advise on side effects, precautions, storage, diet & life style modifications.[10]

Medication Therapy Management (MTM)

Services provided by pharmacists that improve treatment outcomes. These services promote the safe and effective use of medications.[11]As part of medication therapy management (MTM), patient education focusing on dialysis compliance, diet and medications are an effective way to improve health-related QoL and awareness in renal failure patients to improve the outcomes in chronic illness.

About Diet & Life style modifications (to be followed):

- Take salt in a little quantity
- Take cereals, milk, curd and meat in minimum measures
- Boil all vegetables properly before eating
- Avoid the things which are rich in sodium & potassium levels. E.g. Fruit juices

1. Foods can be taken

- Cereals, paneer
- Fruits like papaya, apple, pineapple and guava
- Vegetables

2. Food rich in energy and poor in sodium & potassium levels

- Take butter and ghee in minimum quantity
- Vegetables and vegetable oils

3. Foods poor in sodium & potassium levels

Menthi, beetroot, beans, peanuts, brinjal, potato, pumpkin, bottle guard, raw tomato, raw mango, raw banana, cauliflower, cabbage and turnits

4. Foods to be avoided:

Meat, pickles, spinach, baked cakes, pastries, cool drinks, dry fish, ground nuts and corn.[17]

Need of the study

Attention paid by the primary health care systems to combat the rising epidemic of chronic diseases has been inadequate. And so the health care administrative bodies have continued to expand dialysis services in terms of geographic coverage and capacity to cope with increasing demand. This review may give the information about the essentiality to avoid the progression of the kidney diseases by controlling the risk factors and to prevent & manage the complications associated with haemodialysis. This review provides the epidemiological data which helps the healthcare system to guide strategies for the prevention of kidney disease and planning for the provision of renal replacement therapy.

Ahmed Zahran (2011) conducted a study on Epidemiology of hemodialysis patients in menofia governorate, delta region, Egypt.End stage renal disease (ESRD) has become a worldwide health concern. A questionnaire was conducted on dialysis units in Menofia governorate during the year2011 focusing on demographic data, vascular access, hepatitis C status and causes of ESRD. They got a results of 514 (35 %) from 1450 patients. The prevalence rate of Hemodialysis (HD) was 414 patients per million populations (pmp). The mean age was 52.03 ± 14.67 years,60.3 % male and 39.7 female. The mean duration of dialysis was found to be 41.23 ± 37.59months. The main known cause of ESRD was hypertension (34.8 %), diabetic nephropathy (DN)(16.6 %) while the unknown causes represent 20.6 %. The prevalence of hepatitis C was found tobe 49.6 %.In Menofia governorate there is a high prevalence rate of hemodialysis whichrepresents the only mode of treatment of ESRD patients. Hypertension and diabetes constitute the major known causes.

Elena L I et al. (2011) conducted a Cross sectional epidemiological study in hemodialysis patients in Fundeni Clinical Institute, Bucharest, Romania. The study evaluated HBV, HCV, HDV and HEV infections in various categories of risk populations and seroprevalence of HBV and HCV infections in population asking for a medical examination. This is a cross-sectional, epidemiological study in a population of 2851 subjects from Subcarpathian region of Romania (17 counties, 34% of area and 42% of population), that were stratified in 4 risk categories: controls (n=2540), very low risk (students; n=44), low risk (doctors and nurses; n=93) and high risk populations (hemodialysis patients; n=174). The study reported that the prevalence data of hepatitis viruses (HBV, HCV, HDV) in 174 hemodialysis patients from 6 dialysis centers located in the South part of Romania. In hemodialysis patients, HBV and HCV seroprevalence was 7.91%, respectively 39.26%. HCV-RNA was detectable in 20.69% cases. Female sex and rural area were risk factors for HBV infection and ALT level for HCV infection. The study concluded that theseroprevalence of viral hepatitis infections in Subcarpathian region of Romania is still medium to high compared with Europe, but similar to other Romanian regions or Balkans.

Wiam A et al. (2010) conducted a study on "Epidemiology and etiology of dialysis-treated end-stage kidney disease in Libya". Data of the structured demographic and clinical data were obtained regarding all adult patients treated with dialysis facilities (n=39) in Libya from May to September 2009. Subsequently data were collected prospectively on all new patients who started dialysis from September 2009 to August 2010. The prevalence of dialysis-treated ESKD was 624 per

million populations (pmp). 85% of prevalent patients were aged <65 years and 58% were male. The prevalence of ESKD varied considerably with age with a peak at 55–64 years (2475 pmp for males; 2197 pmp for females).The most common cause of ESKD among prevalent and incident patients was diabetes. Libya has a relatively high prevalence and incidence of dialysis-treated ESKD and this data will guide strategies for the prevention of CKD and planning for the provision of renal replacement therapy.

Rafael P G et al. (2010) conducted a study on "Epidemiological study of 7316 patients on haemodialysis treated in FME clinics in Spain, using data from the EuCliD® database: results from years 2009-2010. Observational study of patients on haemodialysis (HD) inFMC® Spain clinics over the years 2009 and 2010. Data was collected from the EuClid® database, implemented in theFMC® clinics, which comply with the following features: online record, mandatory, conducted in incident patientsand covering the entire population on HD in these clinics. It aims to understand the characteristics of patients andtreatment patterns, comparing them with other studies described in the literature and in order to improve their prognosis and quality of life. It includes 2637 incident and 4679 prevalent patients, which makes a total of 7316 patients. In prevalent patients: 24.4% were diabetic; 76.3% had cardiovascular disease (CVD) and 13.4% cancer. The average duration of the sessions of HD was 230 minutes. 23.2% of prevalent patients were on on-line haemodia filtration. These patients' hospitalisation rates were 0.46 hospitalisations per incident patient per year and 0.52 per prevalent patient per year. The annual gross mortality rate was 12%. The mortality of HD patients in this study is smaller than those of the Spanish Registry of Dialysis and Transplant (GRER). The result of morbidity and mortality of the FMC clinics of Spain can, therefore, be considered good when compared with those of the GRER and other international series.

Suresh C D et al. (2010) conducted a study on Incidence of chronic kidney disease in India. Chronic kidney disease (CKD) is a global threat to health in general and for developing countries in particular, because therapy is expensive and life-long. In India ~90% patients cannot afford the cost. Over 1 million people worldwide are alive on dialysis or with a functioning graft. Incidence of CKD has doubled in the last 15 years. In the USA, ~30 million people suffer from CKD and by 2010 >600 000 patients will require renal replacement therapy, costing US$28 billion. Risk factors for developing CKD differ between races and countries. It would be interesting to know the incidence of CKD and its causes in India, which is a densely populated country with low income, different food, cultural traditions and lifestyle habits. They conducted two studies: (i) a population screening in New Delhi and (ii) a second prospective study that involved 48 hospitals. In the population screening 4712 subjects participated in a blood biochemistry test. The second study was more representative, as 48 centers were distributed all over India. Data were based on prospective investigations conducted over a period of 1 (33 hospitals) to 3 months (15 hospitals) comprising 4145 CKD patients. The two studies, which are different in some ways, perhaps explain the wide range in incidence, suggesting regional influences in both biochemistry test results and etiological concern.

Luis A B Pet al. (2009) conducted a study on "Epidemiological study of end-stage kidney disease in western Paraná- An experience of 878 cases in 25 years". This retrospective epidemiological study assessed a registry of patients admitted for renal substitutive therapy at a single center from 1984 to 2009 by analyzing demographic and clinical characteristics; incidence of CKD; underlying kidney disease; dialysis modalities; mortality; and causes of death. In the period studied, 878 patients were admitted to dialysis. Their mean age was 47.0 Â± 16.2 years, 549 (62.5%) were males, and 712 (81.1%) were white. The major cause of CKD was hypertension in 351 (40.0%) patients, diabetic nephropathy in 174 (19.8%), and chronic glomerulonephritis in 180 (20.5%) patients. The main dialysis modality was hemodialysis. The cohort of patients studied had a low mortality rate. The most common cause of death was cardiovascular, affecting 126 (34.6%) patients. Screening for cardiovascular disease is highly recommended for those patients.

A. L. M. de Francisco et al. (2008) conducted an Epidemiological study on chronic renal failure elderly patients on hemodialysis. Hemodialysis shows an increased prevalence in elderly patients. The objective of this epidemiological,cross-sectional and multicenter study, in patients older than 65 years (n 625) and > 75 years (n 558) from 29 Spanish medical institutions was to perform an epidemiological analysis It included demographic information, as well as data regarding chronic renal failure, functional and psychological abilities (Katz Index, Lawton and Karnofsky Scales), dialysis logistics and clinical parameters. The study analyzed data from 1,183 patients (678 female), mean age 75,4 ± 5,5 years; mean duration of dialysis 4.3 ± 5.1 years (57,7% were referred by the GP: general practitioner). The most frequent etiologies were diabetic nephropathy (21,2%) and vascular renal disease (20,9%). The main comorbilites were high blood pressure (75,6%), Diabetes Mellitus (32,9%) and vascular (29,0%) and osteoarticular (27,3%) diseases. Karnofsky performance scale scored less than 70 in 59,4% of the patients. High permeability

membranes were used in 52,3% of patients and internal arteriovenous fistula in 74,0%. Around 75% of elderly patients on hemodialysis fulfill age-suitable daily living activities and display adequate dialysis quality parameters.

PK Chhetri et al. (2008) conducted a study entitled as chronic kidney disease on hemodialysis in Nepal Medical College with Teaching Hospital - to know the epidemiological profile and etiology of CKD 5 patients attending hemodialysis (HD) unit of Nepal Medical College Teaching Hospital. This is a prospective study which was carried out in HD unit over a period of one year. CKD 5 patients having GFR of <15ml/min/1.73m2 under HD were included in the study. Among 100 patients included in the study 57 were male and mean age of the study population was 46.9 ±17.9 years. Around 20.0% of the study population is on regular follow up while 45.0% were lost to follow up. Twenty percent of the patient underwent transplantation and 15.0% of the study population died. Majority of patients were anemic (85.0%). Correction of anemia was done with blood transfusion in 88.0% and only 12.0% received erythropoietin. Hypertension was the leading cause of CKD 5; majority of patients (45.0%) discontinued hemodialysis most probably due to economical constrain; blood transfusion was the main modality of treatment of anemia.

Massimo Petruzzi1 et al. (2008) conducted a study on Thirst and oral symptoms in people on hemodialysis: a multinational prospective cohort study. It is a detailed global survey on the prevalence of any oral symptoms in hemodialysis. It is plausible that prevalence of oral dryness may be increased with Hemodialysis treatment. A xerostomia inventory and dialysis thirst inventory were both assessed based upon validated methodology by a dental surgeon. Of 1733 hemodialysis patients in the 30 participating clinics selected randomly from a collaborative dialysis network in Europe and South America, 1308 (75%) completed a self-administered questionnaire on oral symptoms. 557 patients (43%) reported occasional use of candies for dry mouth sensation, 313 (24%) had difficulties swallowing and 635 (49%) needed to sip to aid swallowing, 693 (54%) reported waking up during the night to drink, 479 (37%) reported a dry mouth and 642 (50%) reported dry lips. Thirst, as a symptom, was a reported symptom for 823 patients (64%); 1028 (79%) were thirsty during the day and 667 (51%) during the night. Overall, 425 (33%) patients reported that thirst influenced their social life. The mean dialysis thirst inventory score was 18.42 (SD 5.61). The study found oral symptoms were highly prevalent in people receiving hemodialysis, with marked symptoms interfering with daily life. The ORAL-D study will be completed in 2012 and prospectively evaluate the relationship between these reported oral symptoms and major patient level end points including mortality and cardiovascular events at one-year.

Pei-Wen Lee et al.(2007) conducted a study on Epidemiology and mortality in dialysis patients with and without polycystic kidney disease: a national study in Taiwan. Polycystic kidney disease (PCKD) is one of the most common inherited disorders in end-stage renal disease patients. Using Taiwan's national health insurance claims data, was a longitudinal cohort study was performed to investigate the survival and impact of comorbidities on mortality in dialysis patients with and without PCKD. The study excluded patients without diabetes mellitus (DM) in a further analysis. The Kaplan-Meier method was used to describe overall patient survival. Five hundred and one (2.25%) of 22,298 non-diabetic incident dialysis patients had PCKD. Being male, being over 65 years old and having congestive heart failure or cerebrovascular accident were each found to be independent predictors of mortality in the PCKD dialysis patients. Taiwan has a lower incidence rate of PCKD than Western countries. In Taiwan, there is little difference in the long-term survival between dialysis patients with and without PCKD.

Ghamez Moukehet al. (2006) conducted a study of Epidemiology of hemodialysis patients in Aleppo city to determine the characteristics of the hemodialysis (HD) patients, they surveyed the hospitals representing the main dialysis centers in the city including private and community facilities during 2006. Personal patients' interviews and hospitals records were the source of data. The total number of patients in 2006 undergoing HD was 550 patients. There was an equal percentage of both genders in the hemodialysis population, and the age ranged from 5-82 years with mean and median age 44.7 and 45 years, respectively. The incidence (IR) and prevalence rate (PR) for hemodialysis were 60 pmp and 226 pmp, respectively. The major primary renal diseases in the end-stage renal disease (ESRD) patients included hypertension (HTN), glomerulonephritis (GN), and diabetes mellitus (DM), 21.1%, 20.5 %, and 19.45, respectively. The percent of Anti-HCV, HBV hepatitis and HBV vaccine were 54.4%, 7.8%, and 52.9%, respectively. This study suggests that the IR of hemodialysis was relatively low due to the high cost of treatment, and the PR for hemodialysis was also relatively low may be due to high mortality rate and low kidney transplantation rate in this country.

Omar Abboud (2006) conducted a study on Incidence, prevalence, and treatment of end-stage renal disease in the middle east. Data were obtained from English language published literature through a Medline search over the past 40 years.

Supplementary information was gathered from regional congresses and symposia, websites of specialized nephrology centers, and direct communications.Of the 14 Middle East countries, attention was focused on 10 countries with similar renal care systems: 7 Arabian Peninsula countries and 3 eastern Mediterranean countries. Collectively, they have a population of 72.5 million. Incidence of ESRD ranged between 64 and 212 patients per million population (pmp) with an average of 93 patients pmp. The lowest prevalence was 320, the highest was 462, and the average was 352 patients pmp. Renal transplantation is available in all countries with variable program activities. The results from countries with active programs are excellent, with 5-year patient and graft survival of .90%.

Angel L.M.F. et al.(2006) conducted An Epidemiological Study of Hemodialysis Patients Based on the European Fresenius Medical Care Hemodialysis Network: Results of the ARO Study. ARO, an observational study of hemodialysis (HD) patients in Europe, aims to enhance our understanding of patient characteristics and practice patterns toimprove patient outcome. HD patients (n= 8,963) from 134 Fresenius Medical Care facilities treated between 2005 and 2006 were randomly selected from 9 European countries (Czech Republic, France, Hungary, Italy, Poland, Portugal, Spain, Slovak Republic and Slovenia) and Turkey. Information was captured on demographics, comorbidities, medications, laboratory and dialysis parameters, and outcome. Patients were followed for 1.4 ±0.7 years. Wide variation by country was observed for age, sex and diabetes as a cause of chronic kidney disease. Dialysis parameters were homogeneous across countries. Medication use varied widely by country. In total, 5% of patients underwent renal transplantation. Overall death rate was 124/1,000 patient-years. ARO revealed differences in HD practice patterns and patient characteristics in the 10 participating countries. Future ARO studies will fill gaps in the knowledge about the care of European HD patients.

Gascón et al.(2001) conducted an Epidemiological study on hemodialysis treatment in Huesca and Teruel.A cross sectional study was performed in order to evaluate the treatment conditions and medical outcomes among 131 prevalent haemodialysis patients (57% males; mean age 66 ± 12 years). Data were collected at 5 hemodialysis units in Huesca and Teruel. Diabetes mellitus, at 30 percent, was the most common cause of renal insufficiency. They observed that 56.5% of the population reached anURR(urea-reduction ratio) higher than 65%. The duration of dialysis session was 220 ± 24 minutes, with a rate of blood flow 297 ± 47 ml/min. 36% of patients used high-flux membranes. The patterns of vascular access were: 69% arteriovenous fistula, 5% synthetic graft and 26% catheter. Eighty nine percent of patients were treated with erythropoietin. The mean dose of erythropoietin was 109 ± 62 UI/Kg weight/week. Thirty nine percent of patients had haemoglobin below 11.0 g/dl (mean 11.2 ±1.4 g/dl). Ferritin levels were below 100 ng/ml in 24% of the patients and 25% showed a transferrin saturation index below 20%. Fifty percent of patients were receiving vitamin D. The mean serum albumin was 3.4 ± 0.4 g/dl. Forty five percent of patients had albumin below 3.5 g/dl.

Hala MohamadAbd El hamed Ali et al. conducted a study on Impact of Teaching Guidelines on Quality of Life for Hemodialysis Patients. Chronic kidney disease is a worldwide public health problem with an increasing incidence and prevalence, poor outcomes, and high costs. The guidelines are an important step in the process of improving the quality of dialysis practice and improving ESRD patient outcomes. Therefore, the aims of the study were to develop, implement teaching guidelines for HD patients and evaluate the impact of guidelines on QOL for HD patients at the study settings. A Quasi-experimental research design was conducted in the HD units at Urology and Nephrology Center at Mansoura University, Mansoura International Special Hospital and Nabarro General Hospital. The data were collected from 115 adult HD patients of both sexes who corresponded to inclusion criteria. There were a positive correlation between QOL and KPS of studied patients in the three groups in relation to their knowledge. The implementation of teaching guidelines has a positive effect on the studied patients' total knowledge scores and regarding almost QOL domains but there wasn't an effect on patients' KPS score.

Conclusion

Kidney diseases are highly prevalent globally. They have become a major public health problem and associated with considerable co-morbidity and mortality. Maintenance dialysis therapy is the commonest mode of Renal Replacement Therapy (RRT) and demand for this service is increasingly progressively worldwide. Over one million people worldwide are alive on dialysis. In UK, AKI requiring dialysis is 200ppm and in USA by 2010, >6 lakhs patients were on RRT (Dialysis). In India, it is estimated that about 1 lakh persons suffer from ESRD each year. The risk factors for prevalence and incidence of haemodialysis are majorly hypertension and diabetes mellitus. Though haemodialysis is a better method of RRT, there are some complications associated with haemodialysis. This data will be helpful to the health care system to guide the strategies for the prevention of kidney diseases and

planning for the provision of RRT (Renal Replacement Therapy). Awareness of haemodialysis patients on the disease, medication, diet along with the life style modifications through the patient education was found to be very helpful for the patients to control their risk factors and to improve the compliance to the dosage regimen.

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