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A Study of Complications in Patients Undergoing Maintenance Haemodialysis: An Experience in Tertiary Care Hospital

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ABSTRACT

Background: When the kidneys are unable to eliminate toxic substances (impurities or wastes) from the blood, hemodialysis is a viable option. Hemodialysis is a continuous process that takes approximately 4 hours to complete. Unlike normal kidneys, it cannot continuously monitor body functions. However, after a hemodialysis session, it can remove waste products and restore pH and electrolyte levels. Numerous changes in the fluid and mineral compartment occur during the procedure, which causes patients to experience a range of complications ranging from minor to potentially fatal. The study's objectives are to assess and analyse complications that arise from hemodialysis as well as to ascertain the occurrence of such complications.

Methods: This was a prospective study. A data collection form was used to collect demographic data, surgery, comorbidity and the self-design severity scale to note during hemodialysis.

Results: Of the 190 patients in total, 70 (36.6 %) were female and 120 (63.15 %) were male. In 166 (88 %) of the patients who were interviewed, the venous access used for hemodialysis was an arterio venous fistula (AVF). F6HPS was administered as the dialyzer to 82 patients (43.15 %). Our self-made assessment tool revealed that 141 patients (74.21 %) had severe complications, 23 patients (12.105 %) had moderate complications, and 30 patients (15.78 %) had mild complications. In a different investigation, [Mehmood *et al*.,2016] 12.5 % of patients experienced cramps, and 37.5% experienced hypotension. In our study, cramps affected 18 patients (28 %) and hypotension affected 25% of patients as an intra dialytic complication. The primary complications in our study involving patients with AKI and CKD were these two issues. In our study, there is no discernible relationship between age and sex distribution.

Conclusions: According to our study, it is concluded that hypotension (47.8 %), muscle cramps (43.6 %), and hypertension (30.5 %) occur commonly and necessary precautionary measures has to be kept in line, if in case an emergency occur. Fever (3.6 %), hypoglycemia (1.57 %), nausea and vomiting (12.6 %). Significant relationship was seen between complications and age and renal failure in contrasting to it no significant relationship not seen between sex and type of access.

Keywords: Hemodialysis complications, Dialyzer, AVG, AVF, Catheter.

1. INTRODUCTION

Over the past 20 years, kidney disease has become more commonplace worldwide. Kidney disease is primarily caused by diabetes mellitus (DM), which can also be brought on by hypertension, glomerular disease, kidney stones, and the use of over-the-counter medications. Renal replacement therapy (RRT) in the form of kidney transplantation or dialysis (peritoneal or hemodialysis) is the treatment for end-stage renal disease (ESRD). [Singh RG *et.al*, 2015] Hemodialysis (HD) is an important method of renal replacement therapy in acute renal failure (ARF) as well as chronic renal failure (CRF). [Singh R G *et al*.,2015] The start of dialysis therapy shouldn't be postponed too long when renal function is still adequate in order to prevent signs of uremic toxicity and malnourishment. Hemodialysis is a treatment that involves exchanging the patient's blood for a dialysate fluid that simulates normal extracellular fluid in order to remove accumulated metabolic waste products and balance the electrolyte composition of the blood. over a membrane that is semi-permeable. [Zingraff J *et al*.,1995]

Free water and some dissolved solutes leave the dialysate compartment when hydrostatic pressure is applied to remove fluids (ultrafiltration). Three main techniques are employed in this procedure to obtain blood access: 1) intravenous (IV) catheter; 2) arterio venous (AV) fistula; and 3) synthetic graft. A patient's expected time course of renal failure and the state of their vasculature can both have an impact on the type of access. In 2016 [Mehmood Y *et al*.] The most recommended technique is the arteriovenous (AV) fistula. A vascular surgeon uses anastomosis to connect an artery and a vein to form an AV fistula. Blood flows through the fistula quickly thanks to this junction, which helps to pass through the capillaries.[Mehmood Y *et al*.,2016]

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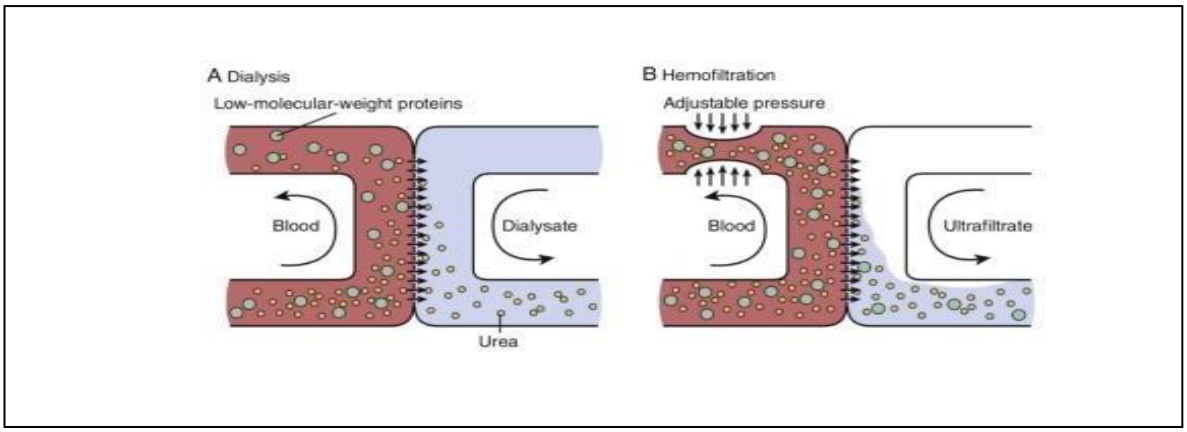

Figure. No 1.1: Hemodialysis mechanism

1.1 EPIDEMIOLOGY

Chronic kidney disease (CKD) affects 10% of the global population, and millions of people pass away every year from poor medical care. [Diabetic Nephropathy. 2014] Chronic kidney disease dropped from 27th place in 1990 to 18th place in 2010 among all causes of death worldwide, according to the 2010 Global Burden of Disease study.[Jha V and others, 2013] Currently, 10% of the world's population—more than 2 million people—receive treatment in the form of dialysis or kidney transplantation in order to survive.[W. G. Couser et al., 2011] According to estimates, the number of kidney failure cases will rise disproportionately in developing nations with growing older populations, like China and India. [Jha V *et al*.,2013] Global estimates place the prevalence of CKD in persons 65 to 74 years old at one in five men and one in four women. [Diabetic Nephropathy. 2014] A 2012 report from the Indian CKD Registry stated that GN, diabetes, and hypertension were the most frequently found causes of kidney failure, with approximately 16% of patients having no apparent cause.

1.2 COMPONENTS OF HEMODIALYSIS

1. The Dialyzer
2. The composition and delivery of the Dialysate.
3. The blood delivery system.

1. DIALYZER:

It's common to refer to a dialyzer as a "artificial kidney." When the patient's kidneys are unable to eliminate excess fluid and waste from the blood, it serves that purpose. There are four ports on the dialyzer: one for dialysate and one for blood. The dialysate compartment and the blood compartment are divided by the semipermeable dialysis membrane. The two methods of transporting information across the membrane are convection (ultrafiltration) and diffusion (dialysis). Little solutes are mostly eliminated by The dialysate compartment and the blood compartment are divided by the semipermeable dialysis membrane. The two methods of transporting information across the membrane are convection (ultrafiltration) and diffusion (dialysis). Larger components, like β2-microglobulin, are better removed by convection, whereas diffusion is the primary method for removing small solutes. [NephroPlus. 2021]

2. DIALYSATE:

The typical calcium concentration is 2.5 meq/lit, while the potassium concentration ranges from 0.4 mmol/l. Patients with hypocalcemia who also have secondary hyperparathyroidism are treated with higher concentrations of calcium. There is between 136 and 140 mmol/l of sodium.

3. BLOOD DELIVERY SYSTEM:

It is made up of the dialysis access and the extracorporeal circuit. The range of blood flow rates is 250–500 ml/min. Native fistulas, like the Brescia Cimino fistula, are frequently used as dialysis access points because they are formed when an artery and vein are anastomose end to side in the cephalic vein, which is then connected to the radial artery. The routine of dialysis treatments is all too familiar to patients: visit the clinic, weigh yourself, have your blood pressure and temperature taken, get stuck with needles (unless you have a catheter access), have tubes connected from your access to the dialyzer, and then sit in a chair until it's time to leave for home. [1921 Hemodialysis]

The dialysate is mixed and monitored by the dialysis machine. The liquid that aids in eliminating undesirable waste products from your blood is called dialysate. It also aids in restoring your body's normal levels of minerals and electrolytes. Additionally, the device keeps track of your blood's movement when it is outside of your body. The liquids

used to mix the dialysate are stored in the plastic jugs. The dialysate is a mixture of bicarbonate, purified water, and an acidified solution that is mixed by the machine. There are minerals and electrolytes in the acidified solution. It may be called "acid" by some. Similar to baking soda, bicarbonate, or bicarb, is the alternative solution. Inside the machine, both are combined with filtered water. Your blood flows through the dialyzer as you dialyze, but they never come into contact. Throughout your treatment, the machine continuously feeds your dialyzer with fresh dialysate. Your blood's impurities are filtered out and transferred to the dialysate. Excess electrolytes and undesired waste products in the dialysate are flushed down the drain after leaving the dialyzer.

Your blood is transported via blood tubing from your dialyzer access. The blood pump is used to thread the blood tubing through. You'll notice a circular motion from the blood pump. Your blood is forced back into your body through the dialyzer by the blood pump's pumping action. When blood passes through the blood tubing, it frequently clots. The nurse will give you a medication called "heparin" to stop this. The dosage of heparin you receive at each treatment is prescribed by your doctor. The machine's "heparin pump" is filled with that quantity of heparin after being drawn up into a syringe. Throughout your treatment, the heparin pump is set up to release the precise quantity of heparin into your blood tubing.

Blood tubing has two built-in air traps to stop this from happening. There are two traps: one before and one after the dialyzer. Any air that might enter the system is captured by these traps. In the event that air escapes these traps, a machine's internal air sensor closes. Figure 1.2 Dialysis by Hemodialysis An alert will sound if the blood pump is stopped. Until the air is gone, all blood flow is halted. The device keeps an eye on the pressures your blood creates inside the dialyzer and blood tubing. Additionally, it keeps an eye on the dialysate's proper mixture, temperature, and blood flow. The machine alerts us when any of these leave range by blinking lights, making an alarm sound, and stopping blood flow. [Davita.com. 2022].

Fig.No 1.2 Hemodialysis Machine

1.3 VASCULAR ACCESS:

There are three types of vascular access for Hemodialysis: [Lazarus JM *et al*.,1974]

1. **An arteriovenous (AV) fistula.**An artery and a vein beneath your arm's skin are connected by a surgeon. Since a fistula is composed entirely of your own blood vessels, it is considered the "gold standard." Years or even decades can pass after an AV fistula. The access that is least vulnerable to blood clots and infections is a fistula. An AV fistula can occur in most people. A fistula might not be an option for you if you have a pacemaker, blood vessel disease, or other medical conditions.

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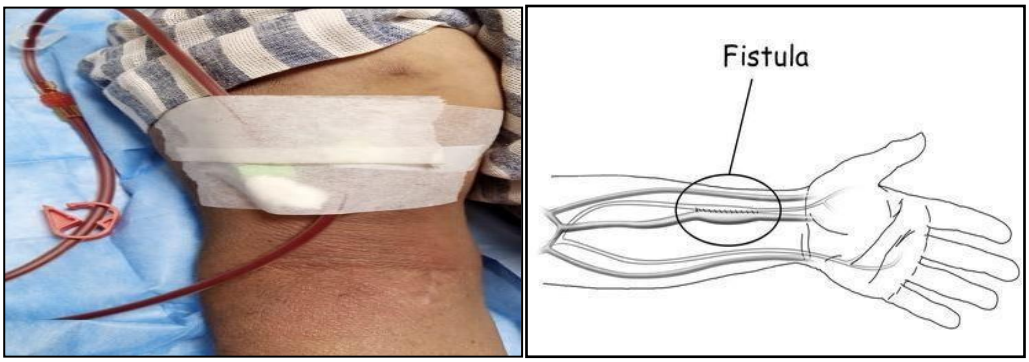

Fig. No 1.3 Arteriovenous (AV) fistula

2. **An AV grafts.** A surgeon links an artery to a vein under the skin of your arm with a piece of synthetic or bovine (from a cow) vein. A graft is the second-best choice. Since it uses tissue that is not your own, a graft is more prone to infection and blood clots than a fistula. Grafts tend to need declotting procedures and a new one must be placed every few years.

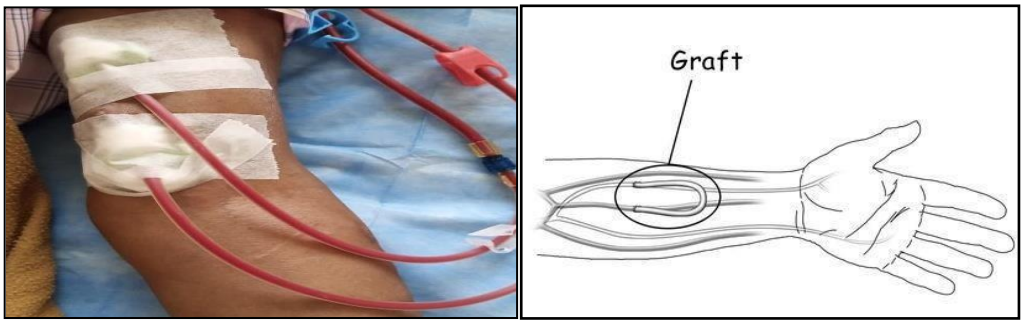

Fig. No 1.4 Arteriovenous (AV) graft

3. **An HD catheter.** A catheter is a Y-shaped plastic tube. One end goes in a central vein in your chest and ends in your heart. The other two ends come out through the skin of your chest. Or, an HD catheter can be placed in a large vein in the groin. The biggest plus of an HD catheter is that it can be put in and used the same day. But, since catheters are a doorway into your body, the risk of infection and death is far higher. And, HD catheters can wear away your vein or cause narrow spots so you can't have any other access on the same side. Catheters are best used for only a short time when possible.

Fig. No 1.4 HD Catheter

1.4 COMMON INDICATIONS FOR HEMODIALYSIS:

One of the most common health problems that the general public in today's society faces is chronic kidney disease (CKD). Over a million people worldwide suffer from chronic kidney disease (CKD), and many of them require renal replacement therapies like dialysis and kidney transplantation. [A summary of kidney disease (2021)]. The two most common risk factors for chronic kidney disease (CKD), which increases the prevalence rates of the illness, are diabetes

and hypertension. In a matter of weeks, the mortality rates from chronic kidney disease (CKD) and its complications would have skyrocketed in the absence of this protocolled approach to "hemodialysis."

1.5 INTRODUCTION TO INTRADIALYTIC COMPLICATIONS OF HEMODIALYSIS:

[Himmelfarb J *et al*.,2005] The difficulties involved in hemodialysis do not go away despite advances in technology. It is essential for the prompt identification and management of potentially fatal complications. Some complications reduce the quality of life of the ten patients, even though they may not be life-threatening. Individuals who get treatment for these problems lead better, longer lives. The following categories comprise complications related to hemodialysis:

HYPOTENSION:

Most common acute complication of hemodialysis (incidence, 15% to 30%) [Ali, M *et al*.,2021]

a. More common in older patients and women Pathogenesis of hypotension:
b. Plasma volume removal (convective and diffusive) [Lever, M. J *et al*.1993]
c. Thermal energy transfer causing vasodilatation
d. Autonomic dysfunction
e. Dialysis membrane biocompatibility
f. Antihypertensive medications

1. MUSCLE CRAMPS:

a. Occur with up to 35%-83% of dialysis treatments [Ulu, M. S *et al*.,2015]
b. Pathogenesis uncertain, but frequently related to acute extracellular volume contraction

2. DIALYSIS DISEQUILIBRIUM SYNDROME [Patel, N.*et al*.,2008]

a. Characterized by nausea, vomiting, headaches, and fatigue
b. Can result in life-threatening seizures, coma, and arrhythmias
c. Pathogenesis from rapid rates of change in solute concentration and pH in the central nervous system Most commonly occurs with high initial solute concentrations

3. ARRHYTHMIAS AND ANGINA[Epstein A *et al*.,1990]

Incidence of atrial arrhythmia is common:

a. Changes in potassium concentration
b. Can be precipitated by hypotension and coronary ischemia
c. Treatment similar to that for patients with normal renal function

Cardiac arrest:

a. Uncommon in outpatient dialysis
b. Related to day of week and dialysate potassium concentration

4. COMPLICATIONS ASSOCIATED WITH USE OF ANTICOAGULANT THERAPY

a. Heparin associated thrombocytopenia
b. Bleeding diathesis
c. Electrolyte abnormalities
d. Hematologic complications
e. Dialyzer Reactions

Reactions attributed to the hemodialyzer are generally divided into two types:

Type A - Anaphylactic reaction Increased risk in patients with a history of atopy, high IgE levels, eosinophilia and allergic reactions during dialysis. [Gauckler, P *et al*.,2018]

Type B - Mild reaction Diagnosis: Type A reaction are severe and rapid in onset, Rare (7.0 per 1000 patient year). Established by three major criteria or two major and one minor criterion [Dialyzer reactions.,2022]

6. INFECTIOUS COMPLICATION:

a. Endotoxin exposure (pyrogenic reactions) from contaminated dialysate or reuse.
b. Infectious outbreaks (e.g., Mycobacterium chelonei) related to improper dialyzer reuse.

7. AIR EMBOLISM:

Etiology:

a. Can be venous or less commonly, arterial. Three vulnerable areas of air entry in dialysis patients: [Air Embolism.,2022]
b. Between patient and blood pump, due to high negative pressure and leaks in the circuit of the segment
c. Air in the dialysate fluid (uncommon, mostly gets trapped in venous chamber)

d. During central venous catheter insertion or removal. Upright body position and hypovolemia, both by reducing venous pressure, Are significant contributing factors [Vesely TM *et al*.,2002].

8. HEMOLYSIS:

Etiology:

a. Mechanical
b. High blood pump flow
c. Single-needle dialysis
d. Small gauge cannula
e. Kinked blood lines
f. High negative arterial pressure
g. Offset blood pump
h. Failure of rinsing
i. Hydrogen peroxide
j. Contamination with hypochlorite, formaldehyde

9. HAEMORRHAGE [Hemorrhage.,2022]

Risk factors include sepsis, co-morbid conditions, uncontrolled hypertension, liver disease, platelet dysfunction, ineffective platelet-vessel wall interaction and heparin-induced thrombocytopenia (HIT), use of anticoagulation during HD, and certain medications (especially anti-platelet drugs), Covered access site, a venous needle falling out, or a broken catheter connection (the drop in venous pressure might not be significant enough to trigger an alarm). Evaluation of Risk: Extremely high: bleeding actively during HD; high: surgical or traumatic wound healed in less than three days; low: wound healed in more than seven days. J).

10. HYPOXIA [Hypoxia.,2022]

Hemodialysis causes a 10-20 mmHg drop in PaO2. In patients with normal oxygen tension, there are no clinical ramifications from this decrease in PaO2, but in critically ill patients with predialysis hypoxemia, it can have disastrous effects.

Etiology:

Acetate dialysate (now obsolete). Can also be seen with use of bicarbonate Dialysate. Acetate causes hypoxemia by at least two mechanisms:

a. Increased oxygen consumption in the metabolism of acetate to bicarbonate.
b. Intradialytic loss of CO2
c. Rapid correction of chronic metabolic acidosis
d. Bioincompatible membranes
e. Activation of complement

Hypopnea due to intradialytic loss of CO2 and adaptation to chronic metabolic acidosis predisposes to periodic breathing and sleep apnea syndrome (SAS). SAS is also a cause of hypoxia in HD patients.

11. PRURITIS

Etiology:

Common abnormalities in ESRD play a role in pathogenesis such as: - Xerosis (dry skin) - Peripheral neuropathy - Hypercalcemia - Hyperphosphatemia – Hypermagnesemia

12. METABOLIC ACIDOSIS [Metabolic acidosis., 2022]

Can occur accidentally as a consequence of dialysate fluid containing improper ratios of acid and base concentrates in the form of acetate or bicarbonate. Develops as a result of the accidental use of an acidic concentrate instead of acetate or bicarbonate and due to computer software malfunction of the machine. Severe metabolic acidosis has been reported during first 2 hours of HD using sorbent regenerative hemodialysis in mechanically ventilated patients.

13. METABOLIC ALKALOSIS

The loss of hydrochloric acid from vomiting or nasogastric suction is the most frequent cause. Less frequent causes include: HD technical glitches, The pH monitor and proportioning system of the dialysis machine are malfunctioning (the bicarbonate and acid concentrate containers are connected to the entry ports in the wrong order).
Severe metabolic alkalosis may cause: - Tissue hypoxia - Arrhythmia - Seizure - Delirium - Stupor

14. HYPOKALEMIA [Wiegand, C. F *et al*.,1981]

Even in cases where the potassium concentration in the dialysate is higher than that in the predialysis serum 33, severe intradialytic hypokalemia may still transpire. Rapid potassium movement from the extracellular to the intracellular space as a result of acidosis correction is the cause of hypokalemia. Hyperkalemia caused by dialysis is uncommon.

15. HYPERKALEMIA

Prevalent in ESRD patients (10% of HD patients). 3-5% of deaths are caused by it [Ahmed J et al., 2001]. Origin: Overconsumption of potassium in the diet - Acidosis in metabolism - An acute infection that clearly catabolizes - Deficit in mineralocorticoids - Rhabdomyolysis - Medication Hyperkalemia brought on by dialysis (rare) Elevated potassium concentration in dialysate – Hemolysis.

16. HYPERNATREMIA

When the sodium concentration is high and the dialysis machine's conductivity monitors are malfunctioning or the alarms are not set correctly, hypernatremia may result. The coated conductivity cells (which are coated with granules from a less soluble batch of sodium bicarbonate powder) may mistakenly sense the dialysate conductivity as low. If a mistake is made when connecting the concentrate containers at the beginning of dialysis. also take place if the conductivity monitor fails and the containers run dry during dialysis. [Bender FH *et al*.,1998]

17. HYPONATREMIA

Hyponatremia can occur at the start of dialysis if an error is made when connecting concentrate containers. During dialysis if containers run dry and conductivity monitor fails [Oliveno JJ.,1978].

Others

a. Nausea
b. Vomiting

There are several reasons why patients experience nausea and vomiting when starting hemodialysis. These symptoms are common in hemodialysis patients because of the sharp decrease in urea or blood pressure. Moreover, mucosal edoema in the gastrointestinal tract and symptoms like nausea, vomiting, and diarrhoea are linked to fluid overload. [Asgari, M. R *et al*.,2017]

Some machine and procedure-related factors, such as the type of dialyzer, the dialysis solution (acetate or bicarbonate), conductivity, blood flow, volume, and rate of ultrafiltration, an anticoagulant used, and contamination of reverse osmosis water, contribute to the multifactorial and poorly understood aetiology of these complications. We refer to these as technical difficulties. These days, they are uncommon due to hemodialysis equipment and technology advancements. Additional factors that affect the patient include the primary disease, coexisting conditions, medications, weight gain caused by intradialysis, frequency, session length, and hemodialysis duration. [Singh R G *et al*.,2015]

1.6 ADVANTAGES OF HEMODIALYSIS:

a. Dialysis is often administered even reception.
b. Peritoneal dialysis may be a comfortable method of dialysis that's easy to use.
c. The equipment utilized in peritoneal dialysis is a smaller amount bulky and straightforward to hold alongside the patient.
d. Unlike peritoneal dialysis, hemodialysis isn't be administered a day.

1.7 DISADVANTAGES OF HEMODIALYSIS: [May 20, 2022]

a. Haemodialysis schedule must be stringently kept.
b. Travel is more complex, requiring advance planning and arrangements.
c. Diet and fluid restrictions must be adhered to strictly.
d. Fistula may seem ungainly and ugly to patient

2. METHOD

2.1 STUDY SITE

ADITYA BIRLA MEMORIAL HOSPITAL, a Tertiary Care Hospital in Chinchwad, Pune.

2.2 STUDY DESIGN

The hospital's Ethics Committee granted ethical approval for this research. Hemodialysis patients who received scheduled dialysis at the tertiary care hospital in Pimpri-Chinchwad during the previous six months were included in this prospective observational study. All four of the group's members collected the data.

2.3 PATIENTS AND DATA COLLECTION

The daily hemodialysis patient file was used to collect the data. Hospitals used dialysis files to periodically gather information from public, private, and community-level health facilities, institutes, and health initiatives. An overview of

health resources, services, and status is given by the information. The patient file, which contains patient and daily hemodialysis chart data, is maintained by the hospital's medical record department. The observers used pre-made forms to collect data in person from the patient file.

NO. OF SUBJECTS
Approx. 200 patients of either sex.

2.5 THE FOLLOWING INFORMATION WAS COLLECTED
a. Demographic details of the patient
b. Medical Record Number
   Name
   Age
   Sex
c. Weight
d. Comorbidities
e. Type of Renal failure
f. Type of Vascular Access
g. Session Of dialysis
h. Type of Dialyzer
i. Ultrafiltration
j. Complications Occur during Hemodialysis
k. Kidney Transplant

2.6 STUDY CRITERIA
1. Inclusion Criteria
a. Subjects suffering from acute kidney failure and chronic kidney failure, those with regular hemodialysis.
b. Patients above 18 years of age on hemodialysis.
c. Has functioning Arteriovenous Fistula or Graft.
d. OPD patients
e. Those who understood the purpose of the study and are ready to provide information regarding their health status and those who signed an informed consent document.

2. Exclusion Criteria
a. Emergency patients
b. Patients below 18 years of age.
c. Patients on chemotherapy.
d. Pregnant or breast feeding.
e. Patient unable to give informed consent

3. MATERIALS
a. Patients Information Sheet. (English and Marathi, Annexure IA and IB).
b. Informed Consent Form. (English and Marathi, Annexure IIA and IIB).
c. Patient Profile form. (Annexure III)
d. Self-design scale to assess the severity of the complications.

4. RESULTS
4.1 STUDY ANALYSIS
The study was performed by taking sample size of approximately 200 patients out of which 190 patients' information was collected using the patient profile form to assess the occurrence and prevalence of complications among patients on hemodialysis.
Statistical assessment was performed by using Chi square and MS excel, the level of significance was 5% ($p<0.05$).
The study was approved by ethical committee.

4.2 OBSERVATION

Table. No.1.1 AGE WISE DISTRIBUTION OF PATIENTS ON HD

We included 190 total patients who are above 18 years of age.

S. no	Age in years	No. of patients	Percentage
1.	18-25	5	3 %

2.	26-35	11	6 %
3.	36-45	37	14 %
4.	46-55	39	20 %
5.	56-65	49	26 %
6.	66-75	52	27 %
7.	76-85	07	4 %

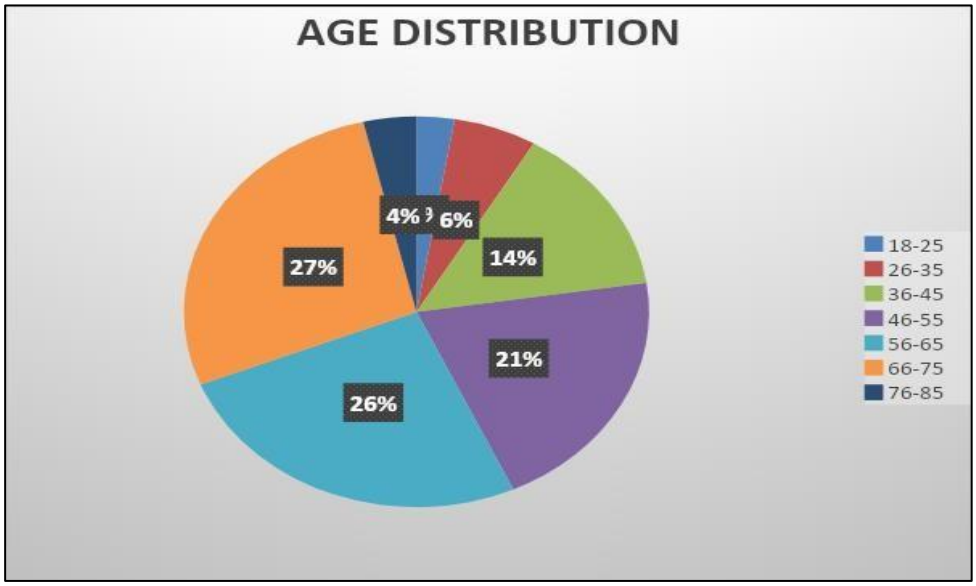

Fig. No. 1.6 AGE WISE DISTRIBUTION OF PATIENTS ON HD

Among our patients for hemodialysis, 66 to75 years age groups constituted 27% and 76 to 85 years was only 4%.

Table. No. 1.2 SEX WISE DISTRIBUTION OF PATIENTS ON HD

S. no	Sex	No. of patients	Percentage
1.	Male	120	63.15789 %
2.	Female	70	36.84211 %

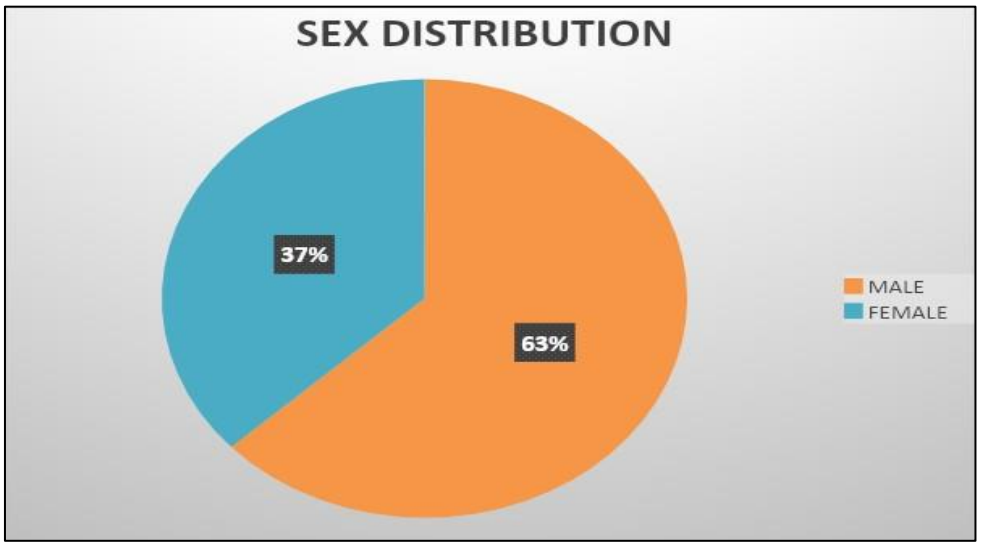

Fig. No. 1.7 SEX WISE DISTRIBUTION OF PATIENTS ON HD

Out of 190 patients, 63% were Male patients and 37% were females.

Table. No. 1.3 DISTRIBUTION OF PATIENTS ON HD WITH COMORBIDITIES.

REDVET - Revista electrónica de Veterinaria - ISSN 1695-7504
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http://www.veterinaria.org
Article Received: Revised: Accepted :

S. no	Comorbidities	No. of patients	Percentage
1.	DM	30	25%
2.	DM, HTN	6	5%
3.	HTN	79	66%
4.	OTHERS	5	4%

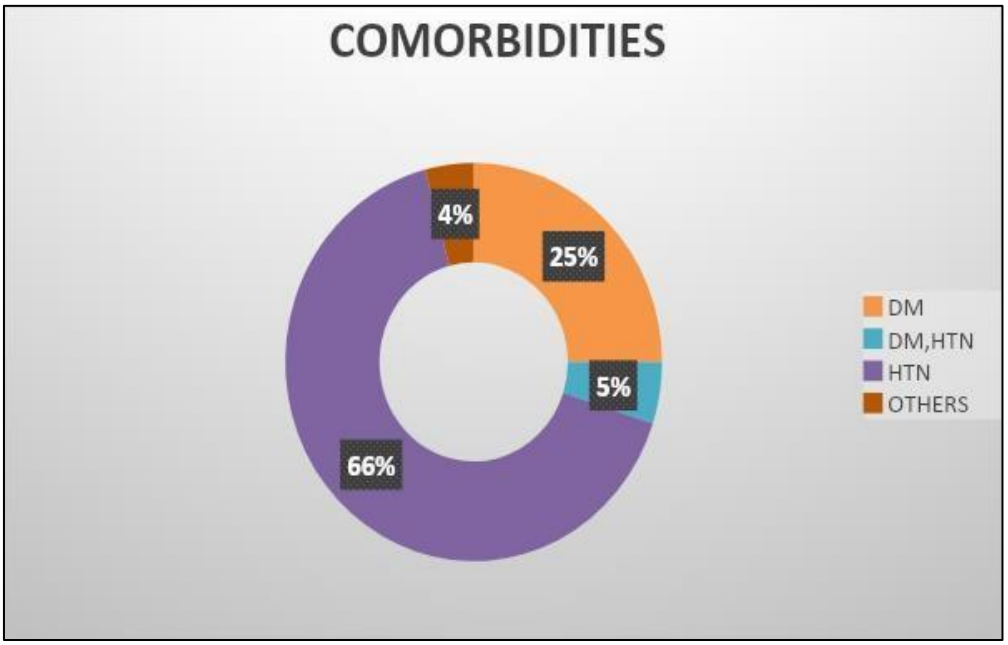

Fig.No.1.8 DISTRIBUTION OF PATIENTS ON HD WITH COMORBIDITIES

Among 190 patients, patients with Hypertension comorbidities were more than Diabetes, Diabetes and Hypertension, Others (CAD, Hypothyroidism, Hyperthyroidism, Gout, Heart Surgery etc.)

Table. No. 1.4 PATTERN OF DISTRIBUTION OF COMPLICATIONS WITH NUMBEROFSESSIONS OF HD

S. no	No of sessions	No. of patients	Percentage
1.	Thrice weekly	134	70.52632%
2.	Twice weekly	57	30%

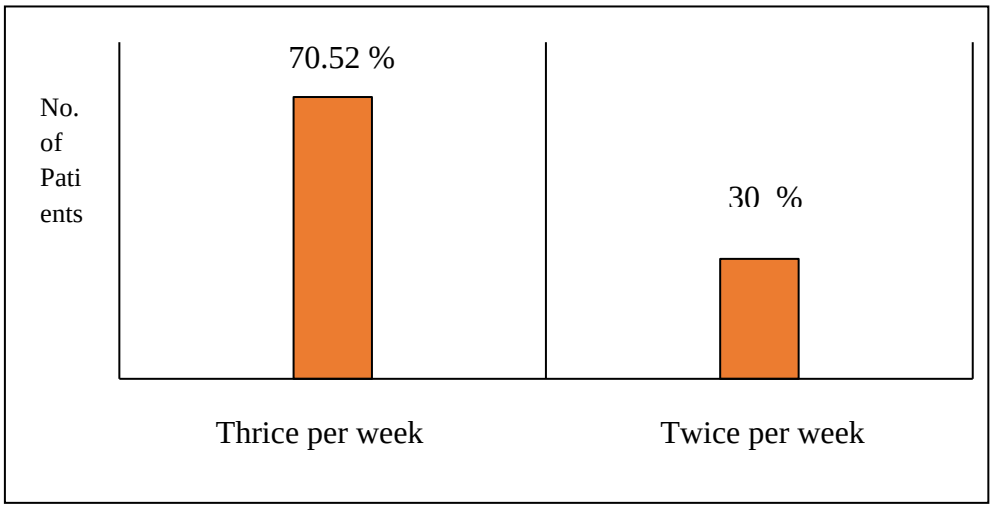

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Fig. No. 1.9 PATTERN OF DISTRIBUTION OF COMPLICATIONS WITH NUMBER OF SESSIONS OF HD
Number of sessions of hemodialysis in our patient group, 70.52 % patients under went hemodialysis thrice weekly.

Table. No. 1.5 DISTRIBUTION OF PATIENTS ON HD WITH DIFFERENT TYPES OFACCESS

S.no	Access	No. of Patients	Percentage
1	AVF	166	88%
2	AVG	19	10%
3	CATHER	4	2%

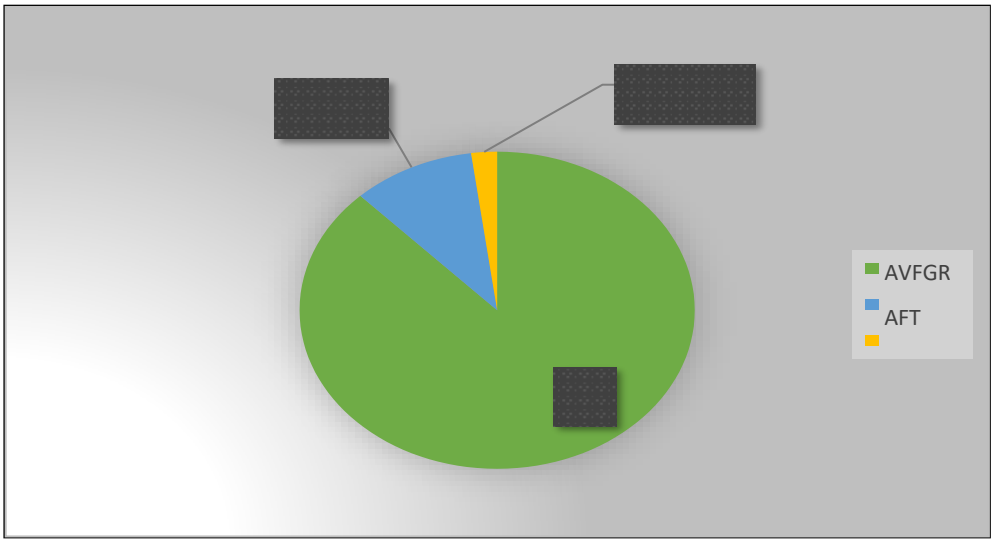

Fig. No. 1.10 DISTRIBUTION OF PATIENTS ON HD WITH DIFFERENT TYPES OF ACCESS
Among 190 patients, patient with AVF (88%) were more than Graft (10%) and Cather patients.

Table. No. 1.6 PATTERN OF VARIOUS COMPLICATIONS ENCOUNTERED DURING HD

S.NO	COMPLICATIONS	NO OF PATIENTS	PERCENTAGE
1.	Hypotension	91	47.8 %
2.	Cramps	83	43.6 %
3.	Nausea & vomiting	24	12.6 %
4.	Itching	20	10.5 %
5.	Breathlessness	20	10.5 %
6.	Hypoglycemia	3	1.577%
7.	Hypertension	58	30.5 %
8.	Fever, chills	7	3.6 %
9.	Headache	7	3.6 %
10.	Air embolism	2	1.0 %

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Vol 25 No.2 (2024)
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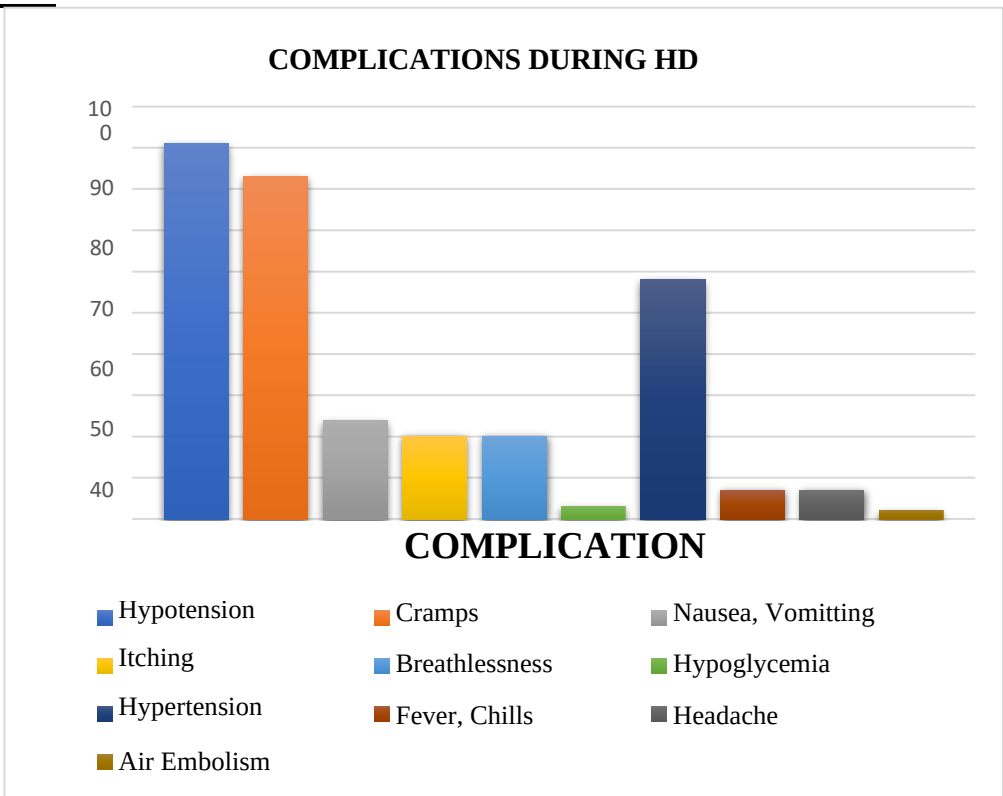


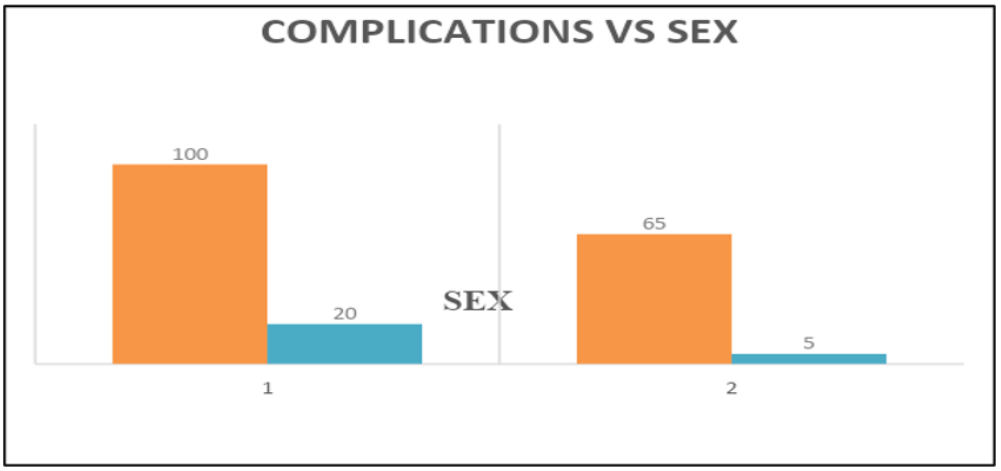
Fig. No. 1.11. PATTERN OF VARIOUS COMPLICATIONS ENCOUNTERED DURING HD

Various complications of HD, 47.8 % due to hypotension and 43.6 % due to cramping and another 30.5 % due to hypertension. These are the most commonly encountered complications during hemodialysis sessions.

Table. No. 1.7 COMPLICATIONS VS SEX

Complication	**Sex**	
	MALE	**FEMALE**
Present	100	65
Absent	20	05
Chi square		
P-value- 06102		
Non-significant		

Fig. No. 1.12 COMPLICATIONS VS SEX



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No significant relationship between gender and complication

Table. No. 1.8 COMPLICATIONS VS RENAL FAILURE

Complications	**CRF**	**ARF**	**ESRD**
Present	155(90.1%)	2(33.3%)	1(66.6%)
Absent	17(9.8%)	4(66.6%)	2(33.3%)
Chisquare test			
P value-0.0000039			
Significant			

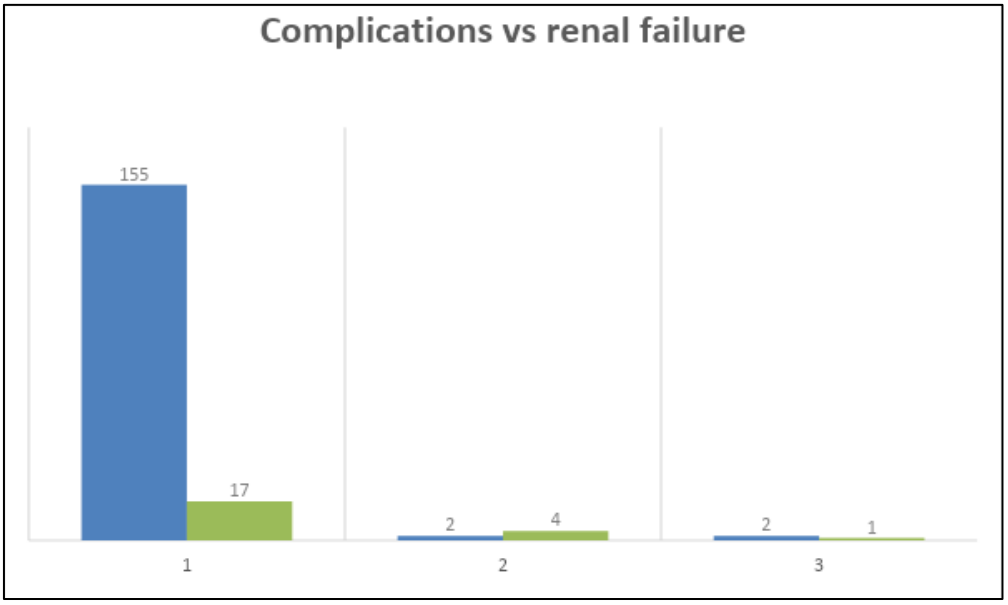

Fig. No. 1.13 COMPLICATION VS RENAL FAILURE
There is significant relationship between hemodialysis complications in patient with CKD (90.1%).

Table. No. 1.9 COMPLICATION VS AGE

Complications	**Age (years)**	
	MEAN	**SD**
Present	26.28	21.148
Absent	2.57	1.51
Unpaired t test		
P value-0.0119		
Significant		

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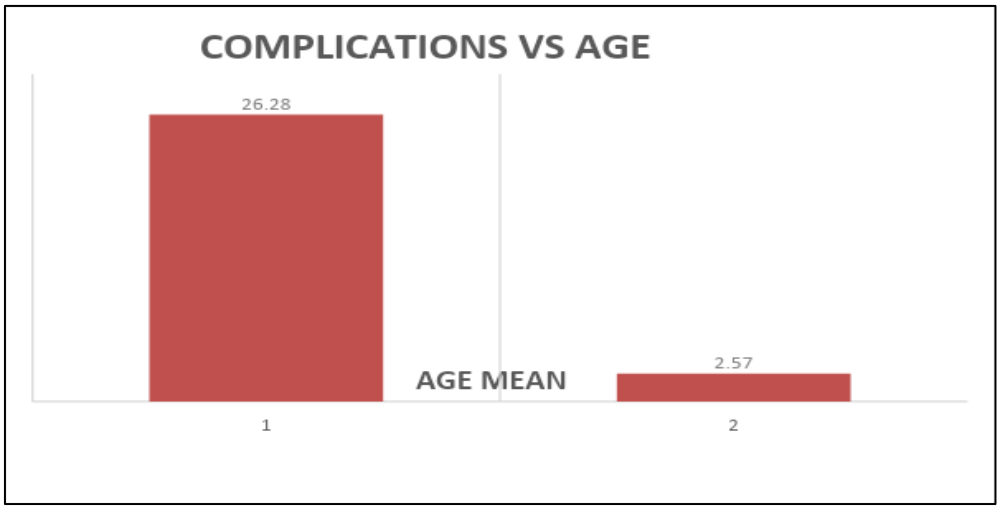

Fig. No. 1.14 COMPLICATION VS AGE

Significant relationship between age and hemodialysis complications noted with in our study.

Table. No. 1.10 COMPLICATIONS VS ACCESS

Complications	Access		
	AVF	**AVG**	**CATHER**
Present	146	3	19
Absent	20	1	0
Chi square			
Pvalue-0.196			
Non-significant			

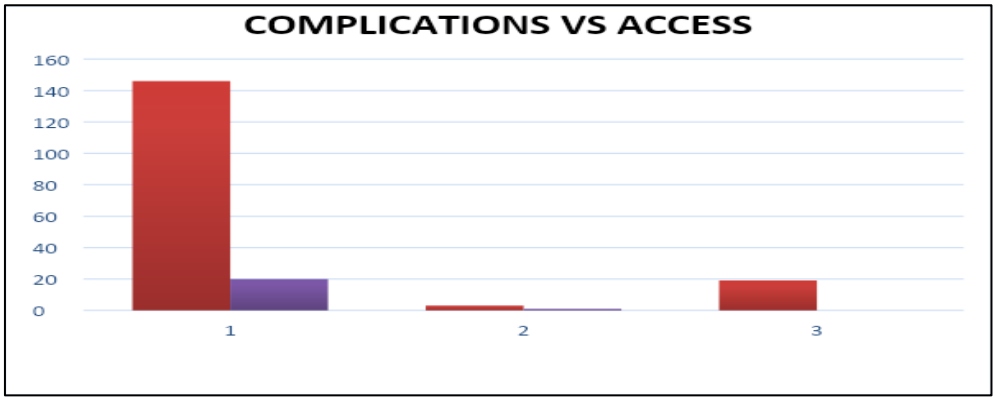

Fig. No. 1.15 COMPLICATION VS ACCESS

No significance noted with the type of access and complications

Table. No.1.11FREQUENCY OF DIALYZER USED

Type of dialyzer	No of patients
F6HPS	82
HF80S	15
F60S	22
F8HPS	48
H60S	3
F6HPA5	1

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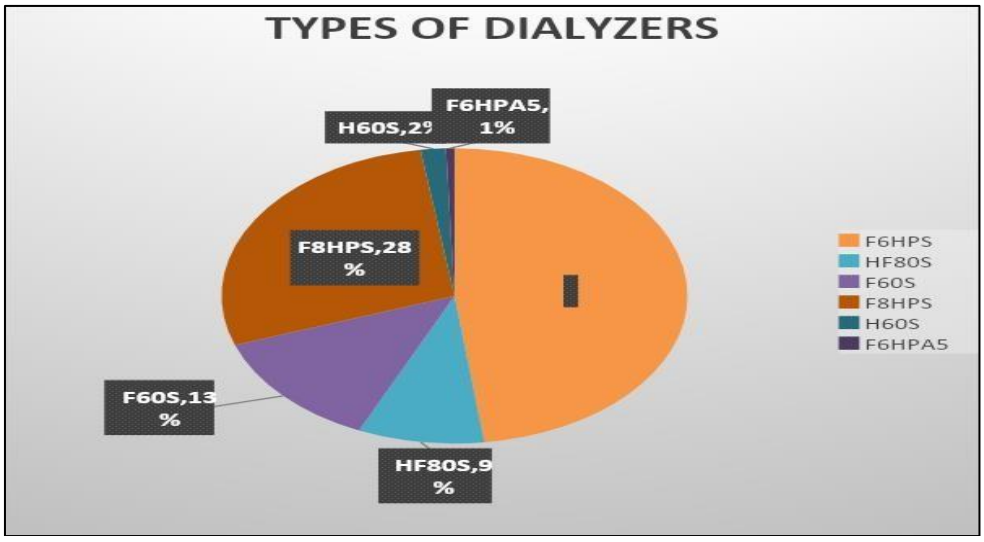

Fig. No. 1.16 FREQUENCY OF DIALYZERS USED

Among 190 patients F6HPS dialyzer is the preferred one than another dialyzer.

Table. No. 1.12 COMPLICATIONS SEVERITY BASED ON SELF DESIGN SCALE

Mild	Moderate	Severe
30 (15.78 %)	23 (12.105 %)	141 (74.21 %)

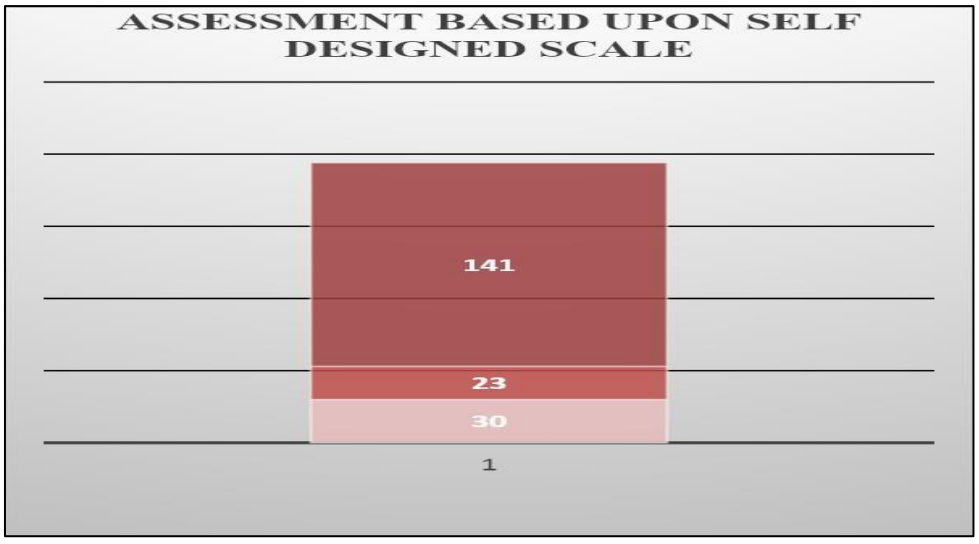

Fig. No. 1.17 COMPLICATIONS SEVERITY BASED ON SELF DESIGN SCALE

Among 190 patients, 141 patients should Severe complications followed by Moderate 23 patients, Mild 30 patients.

5. DISCUSSION

Complications related to hemodialysis are important factors to be monitored and prevented, since, depending on their intensity, they can lead to serious consequences and reduce the quality of life of patients with renal disease. complications associated with maintenance hemodialysis are the major issues in patients with renal disorders, who get into hemodialysis routine as a part of their treatment. In our study, the age of patients ranges from 18 to 85 years. The gender wise data showed male preponderance (1.71:1). The most common comorbidity was found to be HTN (66 %) followed by DM (25%). Out of 190 patients, 134 (70.52 %) patients under went hemodialysis thrice weekly. 167 (88 %) patients had AVF access whereas only 9 (10 %) had Graft access. Hypotension was a frequent complication in our study population. This is acompensatory cardiovascular response during dialysis that occurs when ultra filtration rate exceeds the refilling rate. The rapid removal of osmotically active substances and the delayed balance in intracellular compartments cause temporary decrease in plasma osmolality, justifying hypotension episodes. One study describes hypotension as one of the main a cute complications during hemodialysis, identifying its prevalence in 50% of the

female patients with an average age of 47 years and undergoing hemodialysis, corroborating the data of the present study.**[Atik D *et al*., 2016]**

Cramps were significantly seen in the dialysis patient, cause due large amount of fluid off during your dialysis treatment. Episodes of hypertension were seen rare due to patient either having comorbidity as HTN, or due to an increase in stroke volume and/or vasoconstriction with an inappropriate elevation in PVR during hemodialysis. Some patient had hypoglycemic episodes, caused either due to existing DM or due to decreased gluconeogenesis in the remnant kidneys, deranged metabolic pathways, in adequate nutrition, decreased insulin clearance, glucose loss to the dialysate and diffusion of glucose into erythrocytes during hemodialysis. Chills are generally associated with vascular access infections related to pyrogenic reactions, disinfection of the hemodialysis machine and water treatment. Chills are associated with musculoskeletal changes in patients submitted to hemodialysis, especially in women.**[Atik D *et al*., 2016]**

Episodes of vomiting during hemodialysis have multiple causes, such as increased dialysate sodium and calcium concentrations. **[Singh R G *et al*., 2015]** Head ache was also cited as a complication observed during dialysis, Head ache can becaused by the stress faced by patients undergoing dialysis and is related to the decrease in magnesium levels and increase of sodium levels in the pre-and post-dialysis periods. The order of complications analyzed was 47.8% due to hypotension and 43.6 % due to muscle cramps and another 30.5 % due to hypertension. Hence, with 47.8% patients complaining, hypotension was found to be the most common complication. According to chi square test of our data, no significant relationship was found between gender and complication occurred. Out of 190 patients, 155(90.1%) patients had CKD; indicating a relationship between complication and renal diseases. According to Student t test, a significant relationship was found between age and occurrence of complications. Hence as the age increases, occurrence of complications increases. A P VALUE of 0.196 from chi square test between complications and access, no significant relationship was seen. Out of 190 patients, 82(43.15%) patients were given F6HPS as their dialyzer. According to our self-designed assessment tool, 30(15.78%) patients had mild complications, 23(12.105%) patients had moderate complications and 141(74.21%) patients had severe complications. In another study by [**Mehmood *et al*]** 37.5 % developed hypotension and 12.5 % patients developed cramps. In our study,18 patients (28 %) developed cramps and 25 % patients got hypotension as an intra dialytic complication. These 2 complications were the main complication in our study in AKI and CKD patients. There is no significant age and sex distribution relation in our study.

The associations demonstrated in this study can help health professionals in the early identification of complications during hemodialysis, as well as in there cognition of the socio-demographic and clinical factors that favor their occurrence, assisting them in the adoption of the appropriate actions to reduce risks and, consequently, the complication itself, improving the quality of life of these patients. Complications such as Hemorrhage, hemolysis and arrhythmias did not occur on our study group of HD patients.[**Mehmood *et al*]**

6. CONCLUSION

Hemodialysis is a better procedure for the removal of toxic metabolic end products from body in renal failure patients, but it is associated with risks as well. Hence thorough monitoring of the patient who under went hemodialysis, is required. According to our study, it is concluded that hypotension (47.8%), muscle cramps (43.6%), and hypertension (30.5%) occur commonly and necessary precautionary measures has to be kept in line, if in case an emergency occur. Fever (3.6%), hypoglycemia (1.57%), nausea and vomiting (12.6%).Significant relationship was seen between complications and age and renal failure in contrasting to it no significant relationship not seen between sex and type of access. The understanding of these aspects contributes to health actions able to overcome complications during the hemodialysis procedure, as well as for the early identification of the vulnerability of these patients.

7. FUTURE SCOPE

a. It is a beneficial study for nurses and technicians' team a sit serves the patient centric approach.
b. This study can be helpful for early detection of complications so that team of doctors and technicians can implement there aquired management for complications which can occur.
c. The lesser the frequency of occurrence of complications, better would be the quality of life of patients.
d. The comorbidities of patients can be studied in advance which can help in management of complications occurring.
e. The frequency of complications occurring AKI, CKD, or ESRD patients can be reduced hence, decreasing the mortality and morbidity using the patient centric approach.

8. LIMITATIONS

a. Due to lack of time period, we couldn't evaluate large sample sizes.
b. Since dialysisis a life long treatment procedure, the therapy charges can be expensive.
c. Misinformation or inadequate information provided by patients can lead to improper analysis of results.

d. Although dialysis improves quality of life, but it is also associated with various complications and life-threatening risks.
e. Presence of comorbidities can lead to improper analysis and can increase the risks of complications.

9. REFERENCE

1. Ahmed J, Weisberg L S. Hyperkalemia in dialysis patients:HYPERKALEMIA IN DIALYSIS PATIENTS. Semin Dial [Internet].2001;14(5):348-56. Available from: http://dx.doi.org/10.1046/j.1525-139x.2001.00087.x
2. *Air embolism–advanced renal education program*. (n.d.). Advanced renal education.Com. Retrieved May 20, 2022, from. https://advanced renal education.com/wparep/article/air-embolism.
3. Ali, M., Ejaz, A., Iram, H., Solangi, S. A., Junejo, A. M., & Solangi, S. A. (2021). Frequency of intra dialytic complications in patients of end-stage renal disease on maintenance hemodialysis. *Cureus*, *13*(1), e12641. https://doi.org/10.7759/cureus.12641.
4. Al Jaishi A A, Liu A R, Lok C E, Zhang J C, Moist L M. Complications of the arterio venous fistula: A systematic review. Jam Soc Nephrol [Internet]. 2017 [cited 2022 May 9]; 28 (6): 1839-50. Available from: https://jasn.asn journals.org/content/28/6/1839? WT. MCID=TMD01 & utm_campaign=J_Am_Soc_Nephrol_Trend MD_1 & utm_medium=cpc & utm_source=Trend MD.
5. Asgari, M. R., Asghari, F., Ghods, A. A., Ghorbani, R., Hoshmand Motlagh, N., & Rahaei, F. (2017). Incidence and severity of nausea and vomiting in a group of maintenance hemodialysis patients. *Journal of Renal Injury Prevention*, *6* (1), 49–55. https://doi.org/10.15171/jrip.2017.09.
6. Assimon M M, Fly the JE. Intra dialytic blood pressure abnormalities: The highs, the lows and all that lies between. AmJ Nephrol [Internet].2015;42(5):337-50. Available from: https://www.karger.com/DOI/10.1159/000441982
7. Atik D, Karatepe H, Karatepe C, Demir S, Çınar S, Sökmen S.The effect of gender on the complications, pain intensity and pain management in hemodialysis patients. Int J Res Med Sci. [Internet] 2016;4(5) [acess oem 06 set 2017].
8. Bender F H. Successful treatment of severe hyponatremiaina patient with renal failure using continuous veno venous hemodialysis. Am J Kidney Dis [Internet]. 1998;32 (5): 829-31. Available from: http://dx.doi.org/10.1016/s 0272-6386(98)70141-6
9. Brown JJ, Curtis JR, Lever AF, Robertson JI, De Wardener HE, Wing AJ. Plasma renin concentration and the control of blood pressure in patients on maintenance haemodialysis. Nephron [Internet]. 1969;6 (3):329-49. Available from: http://dx.doi.org/10.1159/000179737
10. Chang TI, Paik J, Greene T, Desai M, Bech F, Cheung AK, *et al*. Intradialytic hypotension and vascular access thrombosis. J Am Soc Nephrol [Internet]. 2011 [cited 2022 May 9]; 22(8):1526-33. Available from: https://jasn.asn journals.org/content/22/8/1526. short
11. Chertow GM MD, MPH, Levy EMMD, Hammermeister KE MD, Grover F MD, Daley JMD. Independent Association between Acute Renal Failure and Mortality following Cardiac Surgery 11 Access the "JournalClub" discussion of this paper at http://www.elsevier.com/locate/ajmselect/22 The VA Continuous Improvement in Cardiac Surgery Program was initially supported by the Health Services Research and Development Service, Veterans Health Administration, and funded through VA Patient Care Services. Am J Med [Internet].1998;104(4):343-8. Available from: https:// www. Science direct. com/ science/ article/ pii/ S0002934398000588
12. *Chronic Kidney Disease*. (2014, September 18). World Kidney Day. http:// www. World kidney day.org /faqs/ chronic-kidney-disease
13. Couser, W. G., Remuzzi, G., Mendis, S., & Tonelli, M. (2011). The contribution of chronic kidney disease to the global burden of major non communicable diseases. *Kidney International*, *80*(12), 1258-1270.https://doi.org/10.1038/ki.2011.368
14. Culp K, Flanigan M, Taylor L, Rothstein M. Vascular access thrombosis in new hemodialysis patients. Am J Kidney Dis [Internet]. 1995; 26 (2): 341-6.Availablefrom:http://dx.doi.org/10.1016/0272-6386(95)90655-x.
15. D.Dialysis.Kidney[Internet].2008;17(3):146-51. Available from: http://dx.doi.org/10.1007/s00596-008-0029-2
16. Degoulet P, Legrain M, Réach I, Aimé F, Devriés C, Rojas P, et al. Mortality risk factors in patients treated by chronic hemodialysis. Report of the Diaphane collaborative study. Nephron [Internet]. 1982;31(2):103-10. Availablefrom:https://www.karger.com/DOI/10.1159/000182627
17. *Dialyzer reactions-advanced renal education program*. (n.d.). Advanced renal education. Com.Retrieved May 20,2022, from https://advanced renal education.com/wparep/article/dialyzer-reactions/.
18. Dobkin J F , Miller M H, Steigbige lNH. Septicemia in patients on chronic hemodialysis. Ann Intern Med [Internet]. 1978;88(1):28-33. Available from: http://dx.doi.org/10.7326/0003-4819-88-1-28.
19. Epstein A, Kay G, Plumb V: Considerations in the diagnosis and treatment of arrhythmias in patients with end-stagerenal disease. Semin Dial 2:31-37,1990
20. Gauckler, P., Shin, J. I., Mayer, G., & Kronbichler, A. (2018). Eosinophilia and kidney disease: More than just an incidental finding ? *Journal of Clinical Medicine*, *7*(12),529. https://doi.org/10.3390/jcm7120529.

21. *Hemodialysis*. (2021, December 9). National Institute of Diabetes and Digestive and Kidney Diseases; NIDDK|National Institute of Diabetes and Digestive and Kidney Diseases. https://www.niddk.nih.gov/health-information/kidney-disease/kidney-failure/hemodialysis.
22. *Hemorrhage–advanced renal education program*. (n.d.). Advanced renal education. Com. Retrieved May 20,2022, from https://advanced renal education.com/wparep/article/hemorrhage.
23. Himmel farb J. Hemodialysis complications. Am J Kidney Dis[Internet]. 2005;45(6):1122-31. Available from: http://dx.doi.org/10.1053/j.ajkd.2005.02.031.
24. How does a dialysisma chine work? [Internet]. Davita. com. [cited2022 May 9]. Available from: https://www.davita.com/treatment-services/dialysis/in-center-hemodialysis/how-does-a-dialysis-machine-work.
25. *Hypoxia–advanced renal education program*. (n.d.). Advanced renal education. Com. Retrieved May 20,2022, from https://advanced renal education.com/wparep/article/hypoxia/.
26. Jha V, Garcia-Garcia G, Iseki K, *et al*. Chronic kidney disease: global dimensionand perspectives. *Lancet.* Jul 20 2013;382(9888): 260-272.
27. *Kidney disease: The basics*. (2021, April 8). National Kidney Foundation. https: //www. kidney.org/news/newsroom/fsindex.
28. Kuipers J, Verboom L M, Ipema K J R, Paans W, Krijnen W P, Gaillard CAJM, *et al*. The prevalence of intradialytic hypotension in patients on conventional hemodialysis: A systematic review with meta-analysis. Am J Nephrol [Internet]. 2019;49(6):497-506. Available from: https://www.karger.com/DOI/10.1159/000500877.
29. Lazarus J M, Morgan A P. Vascular access in hemodialysis. AORNJ [Internet]. 1974;20(5):810-5. Available from: http://dx.doi.org/10.1016/s0001-2092(07)63429-2.
30. LeSar CJ, Merrick HW, Smith MR. Thrombotic complications resulting from hypercoagulable states in chronic hemodialysis vascular access. J Am Coll Surg [Internet]. 1999;189(1):73-9; discussion79-81. Available from: https://www.sciencedirect.com/science/article/pii/S1072751599000861.
31. Lever,M.J.,&Jay,M.T.(1993).Convective and diffusive transport to plasma proteins across the walls of large blood vessels. *Frontiers of Medical and Biological Engineering: The International Journal of the Japan Society of Medical Electronics and Biological Engineering*, *5*(1),45–50.
32. Lundin AP. Maintenance hemodialysis: Survival beyond the first decade. JAMA [Internet]. 1980 [cited 2022 May 9]; 244 (1): 38. Available from: https://jamanet work.com/journals/jama/article-abstract/370535.
33. Man N.K, Zingraff J,Jungers P. Long-Term Hemodialysis. Dordrecht: Springer Netherlands; 1995.
34. Mehmood Y, Ghafoor S, Imran M A, Riaz H, SrA, Saeed M. Intradialytic Complications Found in Patients at a Tertiary Care Hospital. Austin J Pharmacol Ther. 2016;4(1).
35. *Metabolicacidosis–advanced renal education program*.(n.d.). Advanced renal education. Com. Retrieved May 20, 2022, from https://advancedrenaleducation.com/wparep/article/metabolic-acidosis.
36. Oliveno J J. Severe Hyponatremia in a homedialysis patient. JAMA. 1978;239:108-9.
37. Patel, N., Dalal, P., & Panesar, M. (2008). Dialysis dise quilibrium syndrome: anarrative review: Dialysis disequilibrium syndrome. *Seminars in Dialysis*, *21*(5),493-498. https://doi.org/10.1111/j.1525-139X.2008.00474.x
38. Prabhakar, Singh RG, Singh S, Rathore SS, Choudhary TA. Spectrum of intradialytic complications during hemodialysis and its management: a single-center experience. Saudi J Kidney Dis Transpl [Internet].2015;26(1):168–72. Available from: http://dx.doi.org/10.4103/1319-2442.148771
39. Reilly D T, Wood R F, Bell P R. Prospective study of dialysis fistulas: problem Patients and their treatment. Br J Surg [Internet]. 1982;69(9):549-53. Available from: http://dx.doi.org/10.1002/bjs.1800690918.
40. Shield Square captcha [Internet]. Iop.org. [cited 2022 May 9]. Available from: https://iopscience. iop.org/article/10.1088/0967-3334/35/9/1885/meta
41. Shoji T, T subakihara Y, Fujii M, Imai E. Hemodialysis-associated hypotension as an independent risk factor for two-year mortality in hemodialysis patients. Kidney Int [Internet]. 20-4;66(3):1212-20.
42. Sklar A H, Riesenberg L A, Silber A K, Ahmed W, AliA. Post dialysis fatigue. Am J Kidney Dis [Internet]. 1996;28 (5):732-6. Available from: https://www.sciencedirect.com/science/article/pii/S0272638696902565.
43. *The advantages & disadvantages of hemodialysis*. (n.d.). Laminate medical. Com. Retrieved May 20, 2022, from.http://www.laminate medical.com/2016/10/05/advantages-disadvantages-hemodialysis/
44. Thomas B, Wulf S, Bikbov B, Perico N, Cortinovis M, Courville de Vaccaro K, *et al*. Maintenance Dialysis throughout the World in Years 1990 and 2010. J Am Soc Nephrol [Internet]. 2015 [cited 2022May9];26(11):2621-33.Available from: https://jasn.asnjournals.org/content/26/11/2621.short
45. Thomson G E. Hemodialysis for chronic renal failure: Clinical observations. Arch Intern Med[Internet]. 1967 [cited 2022 May 9];120(2):153. Available from:https://jamanetwork.com/journals/jamainternalmedicine/article-abstract/573723.
46. Ulu, M. S., & Ahsen, A. (2015). Muscle Cramps During Hemodialysis: What can we Do? New Approachs for Treatment and Preventing. *Electronic Journal of General Medicine*, *12*(3), 277-281.https://doi.org/10.15197/ejgm.01391
47. Vanholder V, Hoenich N, Ringoir S. Morbidity and mortality of central venous catheter hemodialysis: are view of 10

years' experience. Nephron [Internet]. 1987; 47 (4): 274-9. Available from: https://www.karger.com/DOI/10.1159/000184523.

48. Vesely T M. Air embolism during insertion of central venous catheters. J V asc Interv Radiol [Internet]. 2001;12 (11): 1291-5. Available from: http://dx.doi.org/10.1016/s1051-0443(07)61554-1.
49. What is a dialyzer ? [Internet]. Nephro Plus. 2021 [cited 2022 May 9]. Available from: .https://www.nephroplus.com/what-is-a-dialyzer/
50. Wiegand, C. F., Davin, T. D., Raij, L., & K jellstrand, C. M. (1981). Severe hypokalemia induced by hemodialysis. *Archives of Internal Medicine*, *141* (2), 167-170. https://doi.org/10.1001/archinte. 141.2.167