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Research

An Observational Study on Assessment of Etiological and Clinical Profile in Patient with CKD in Tertiary Care Hospital

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Abstract

Introduction: The term chronic kidney disease (CKD) refers to a decline in renal function that occurs gradually over three months to years. A physical injury, illness, such as diabetes mellitus (DM) or high blood pressure, can all affect the kidneys. They are unable to filter blood or carry out other tasks due to kidney sickness. This is typically accompanied with proteinuria and a decline in glomerular filtration rate (GFR).

Methodology: In this cross-sectional observational research, 120 individuals with various stages of chronic renal disease were included. To gather information from patients and medical records, a legitimate and trustworthy patient-specific data collecting form was developed. Student researchers developed the profile form after it had been verified by many standard publications.

Results: In this study, among the study population 120, most of them were females followed by males. CKD was more in this from group 51 to 60. The most prevalent symptom observed in CKD patients were pallor and the consistently high risk factors in CKD patients was Diabetes mellitus. The prescribing trends in managing CKD patients was evaluated. A wide range of drug classes prescribed in CKD patients were identified. Antihyperglycemic drugs most commonly utilized followed by antihypertensive drugs, blood forming agents and nutritional supplements.

Conclusion: This result of the study indicates that CKD is a significant public health issue in India, Diabetes mellitus was the frequent cause of risk observed in the study population. Multiple observations were made of abnormal laboratory parameters were observed such as Elevated Creatinine, followed by Decreased Hemoglobin, Decreased RBC, Decreased Iron, Decreased Total protein, Elevated Uric acid. The presence of several comorbidities resulted in poly pharmacy in CKD patients. Hemodialysis has demonstrated to be life-saving therapy for patients with end-stage CKD.

Keywords: Chronic Kidney Disease, Acute Kidney Injury, End Stage Renal Disease, Nephrolithiasis, Hypertension.

INTRODUCTION

The two tiny organs known as the kidneys are situated on either side of the spine, near the rear of the abdominal cavity, and right underneath the rib cage. The right kidney is somewhat lower than the left due to the location of the liver. [1]

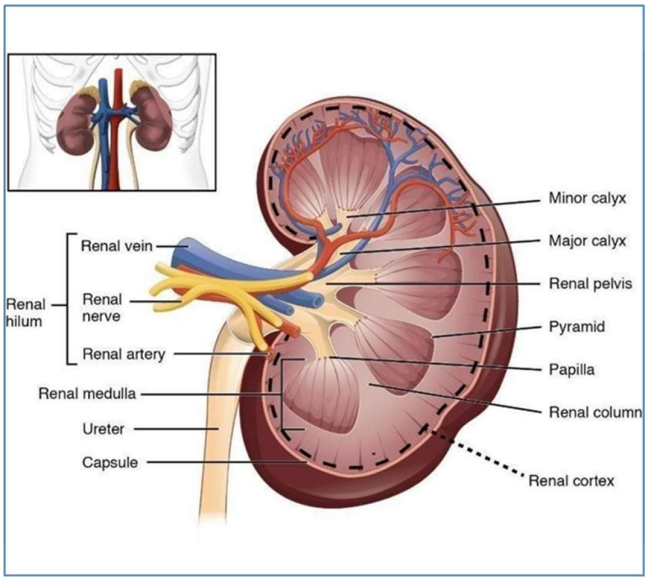


Fig 1: Structure of Kidney

Adult kidneys weigh about 150g, have a length and width of 10 to 12 cm and 5 to 7 cm, respectively. Wastes are removed by the kidneys and turned into urine, which subsequently purifies the blood. Each kidney releases urine into the bladder through a tube known as a ureter, where it is stored. [2] Urine exits the bladder through a tube known as the urethra. In women, the urethra directly enters the vagina, while in men, it opens at the apex of the penis.

Kidney Diseases [4,5]

- Pyelonephritis (Kidney Pelvis Infection)
- Glomerulonephritis
- Kidney stones (Nephrolithiasis)
- Nephrotic syndrome
- Polycystic kidney disease
- Acute Renal Failure (Kidney Failure)
- Chronic Renal Failure
- End-stage Renal Disease (ESRD)
- Papillary Necrosis
- Diabetic Nephropathy
- Hypertensive Nephropathy
- Kidney Cancer
- Interstitial Nephritis
- Minimal Change Disease
- Nephrogenic Diabetes Insipidus
- Renal Cyst

Acute Renal Failure (AKD)

Acute renal failure is the term for the fast, perhaps reversible deterioration of the kidney. Acute renal failure (ARF), is a short window of kidney damage or malfunction that last for a few hours to a few days.

AKI makes it challenging for the kidneys to keep a proper balance of fluids in your body and results to an accumulation of waste material in the blood. Additional organs like the brain, heart, and lungs could also be damaged by AKI. [6]

Chronic Kidney Disease (CKD)

A gradual decline of kidney function is a characteristic of renal disease, commonly known as chronic kidney failure. Because of damage to your kidneys occurs progressively for a longer period of time, this illness is known as "chronic". Treatment strategies includes of efforts to reduce complications, minimize symptoms, and slow down the disease's growth. [8]

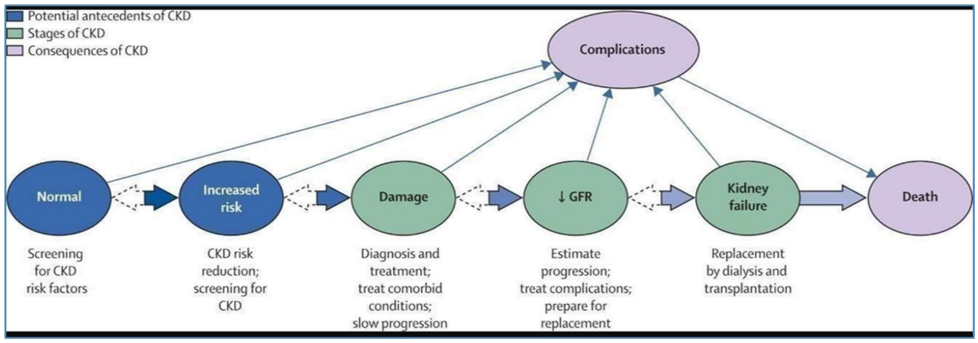


Fig 2: Progression of Chronic Kidney Disease

Epidemiology

Around the world, the prevalence of CKD is rapidly increasing. By the end of 2004, there were 1,783,000 ESRD patients receiving treatment worldwide, with 23% undergoing a functional renal transplant (RT) and 77% undergoing dialysis. This count is increasing yearly at a rate of 7%. [10]

Pathophysiology

Continual harm from severe and chronic nephropathies leads to repeated organ inflammation and loss of the normal structure of the kidney, in contrast to acute kidney injury (AKI), which heals entirely with full functional recovery of the kidney. This impacts the kidney's three main components: the glomeruli, tubules, interstitium, and arteries. Histopathology indicates that it presents as vascular sclerosis, tubule interstitial fibrosis, and glomerulo sclerosis.

Fibrosis and scarring are multi-stage occurrences that are the outcome of a challenging, recurring chain of circumstances. Extrinsic inflammatory infiltration causes extracellular matrix (ECM) - producing cells, such progenitor cells and macrophages, to proliferate and lose intrinsic renal cells via apoptosis, necrosis, mesangiolysis, and podo cytopenia in damagedmKidneys. In order toreplace the architecture, ECM is also deposited. Mechanisms responsible for Progression/growth of CKD:

- Glomerular enlargement,
- Renal tubular deposition of calcium and phosphate,
- Systemic and glomerular capillary hypertension,
- Impaired prostanoid metabolic activity

Numerous underlying disorders can cause CKD; nevertheless, once roughly more than half nephrons are gone, CKD proceeds uniformly regardless of etiology.

- Reduced Nephron mass, or the total number of nephrons loss is the underlying reason which results in
- Increased Glomerular leakage leads to increased lost of proteins in urine
- Activation of Renin angiotensin aldosterone system
- Release of cytokines, inflammatory mediators
- Increased growth factors

These all alterations results in adaptive hyper filtration. The residual nephrons are damaged as a consequence of intra glomerular capillary pressure and pro inflammatory cytokines, which happens as a compensatory response and contributes to glomerular hypertension. [12]

Stages

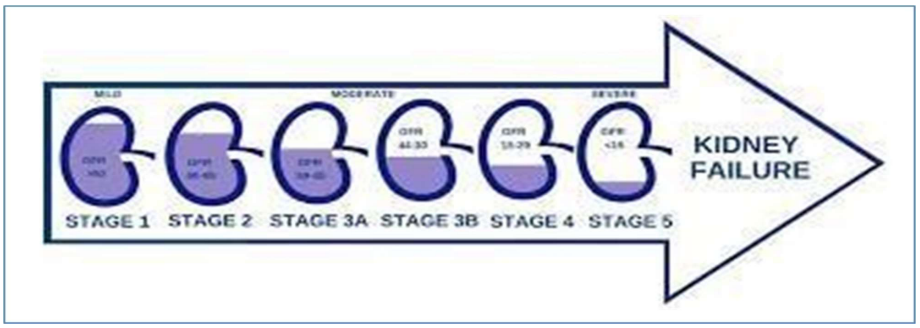


Fig 3: Stages of CKD

GFR, or glomerular filtration rate, is a measurement of how far progressed CKD is in a person. The GFR reveals how efficiently a person's kidneys are eliminating wastes. The GFR of an individual can vary based on their age, sex, and physical size. The amount of creatinine in a person's blood can be utilized by a doctor to estimate their GFR. The amount of creatinine that the kidneys eliminate from the blood is essentially consistent when they are functioning properly. A person's kidney health may be indicated by changes in blood creatinine levels. A doctor can categorize CKD into the following stages based on changes in a patient's GFR.
[13,14,15]

Etiology & Risk Factors

- Impaired urine flow
- Polycystic kidney disease, pyelonephritis, and glomerulonephritis.
- Kidney artery stenosis
- Heavy metal poisoning: Lead is a common source of poisoning.
- Issues with Fetal development
- autoimmune disease Systemic lupus erythematous:
- Mosquito-borne illnesses malaria and yellow fever.
- Excessive use of specific medications, particularly NSAIDs.
- Physical Kidney injury [16]

Clinical Manifestations

- A High Blood Pressure
- Vomiting and Nausea
- Disturbances in Eating Pattern
- A Metallic Taste
- Fatigue
- Weakness
- Problems Thinking
- Disturbances in Sleeping
- Anemia
- Chest Discomfort
- Ankle and Foot Swelling
- Itchiness
- Muscle Twitches and Cramps
- Swelling in Your Feet and Ankles;
- Edema, Or Swelling Hands, Feet.

Diagnosis

1. Physical symptom assessment [21,22]
    a. Metabolic changes: Changes in Sodium levels

b. Cardiovascular problems: Hypertension, swelling of legs and hands, congestive heart failure etc.
c. Neurological problems: An inability to focus, memory loss, and lethargy are examples of neurological symptoms. Peripheral neuropathy, discomfort, itching, and a burning feeling are examples of neuromuscular findings
d. GI manifestations GI symptoms can include anorexia, nausea, hiccups, vomiting, constipation, stomatitis, and an off-putting after taste. Incidences of diverticulosis, pancreatitis, and ulcers are all higher in CKD patients.
e. Respiratory problems: Dyspnea, pulmonary edema, pleuritic discomfort, and uremic pleuritis are respiratory issues that may occur when CHF is present.

2. Results of Diagnostic tests
   a. Creatinine clearance
   b. Increased serum creatinine and BUN levels.
   c. Decreased bicarbonate and arterial pH levels.
   d. A lower level of serum calcium.
   e. Elevated potassium and phosphate levels in the serum.
3. Radiographic findings. It can be possible to do nephrotomography, IV pyelography, renal scan, renal arteriography, and radiography of the kidney, ureter, and bladder.

Management of CKD

Goals of treatment

- Increase patient comfort and life expectancy.
- Manage CKD systemic symptoms.
- Correct abnormalities in body chemistry.

In general, CKD patients are managed conservatively. Prior to the need for or availability of dialysis or kidney transplantation, patients' comfort can be improved and their lives may be extended with dietary changes and fluid restriction.

Treating Edema

- ACE inhibitors, which assist maintain renal function and often have less adverse effects than some other antihypertensive drugs, are frequently used to reduce the worsening of CKD. They also help in reducing nephrotic syndrome and proteinuria.
- Diuretics: Osmotic, loop, or thiazide-like diuretics could be employed. [23]

Treating Hypertension

If edema and the high renin concentrations that arise in CKD lead blood pressure to rise to unacceptable levels, antihypertensive medications may be required. Antihypertensive medication should be started at the lowest effective dose that is still effective and then increased or decreased as needed for the patient.

- Captopril, enalapril, lisinopril, and fosinopril are ACE inhibitors.
- ACE inhibitors may be substituted with dihydropyridine calcium-channel blockers, such as amlodipine and felodipine, due to their similar effects.
- Adrenergic blockers, such as propranolol and atenolol, lower blood pressure in a number of different ways.
- Other antihypertensive medications, such as adrenergic stimulants, clonidine, and vasodilators like hydralazine, are occasionally used to treat chronic kidney disease (CKD).

Treating Hyperphosphatemia

- Involves giving a phosphate binder, such as calcium carbonate or aluminum hydroxide, to the patient.

Treating Hypocalcaemia

- Oral calcium salts Calcium salts taken orally
- Vitamin D
- Intestinal calcium and phosphate absorption and use are encouraged by vitamin D, which raises the serum calcium concentration.
- Calcitriol (vitamin D3) is the recommended vitamin D medication for the management of hypocalcaemia and CKD due to its improved effectiveness and comparatively short period of action.

Treating Other Systemic Manifestations of CKD Treating Anemia

- Epoetin alfa, iron (such as ferrous sulphate), and folate supplements are used in the treatment of anemia.
    - Red blood cell transfusion may be necessary in cases of severe anemia.
- Epoetin alfa increases the production of hemoglobin and red cell-producing cells. It also hastens the bone marrow's discharge of reticulocytes.
    - A 50 to 100 U/kg intravenous or subcutaneous dose of epoetin alfa is administered as a first dose three times per week. To get the desired result, you can increase the dose.
    - Patients with hematocrits < 30% respond best to epoetin alfa treatment. The hematocrit rises in the starting phase of treatment by 1.0% to 3.5% over a 2- week period. The ideal hematocrit ranges from 33% to 35%. After this level is reached, maintenance doses are titrated based on hematocrit
    - If the hematocrit is higher than 36%, epoetin alfa medication should be temporarily discontinued. Up to 25% of people may experience hypertension as additional adverse effects. There have been reports of headaches and fatigue.
    - The properties and effectiveness of epoetin alfa mainly depend on the availability of iron for the production of hemoglobin. Iron storage in patients who don't improve should be examined. Serum ferritin, total iron-binding capacity, transferrin saturation, and serum ferritin are all included in this. As recommended, iron supplementation needs to be increased.
- Darbepoetin, epoetin alfa analogue. Benefit is extended plasma half-life, which enables it to be consumed once or twice a week.
- Iron supplements can be administered intravenously to replenish iron reserves. GI intolerance and inadequate oral absorption make this method preferable to oral supplementation. Although iron dextran is frequently employed, it is linked to hypotension and hypersensitivity.

Treating disturbances related to gastrointestinal tract

- Antiemetics aid in reducing nausea and vomiting.
- To prevent constipation, docusate sodium or methylcellulose may be administered.
- To remove blood from the GI system, enemas may be used.

Treating Body Chemistry Alterations Treating Hyperkalemia

- Acute, fatal hyperkalemia may be treated with dialysis.
- Calcium gluconate or chloride of calcium. [25]

Treating Metabolic Acidosis

To treat serious metabolic acidosis in an emergency, sodium bicarbonate may be administered. Therapeutic impact and mechanism of action. IV sodium bicarbonate raises arterial pH and replaces the bicarbonate such that renal tubules are unable to reabsorb. This lowers the serum potassium concentration and causes potassium to move from the blood into the cells.

Treating Hyponatremia

- Liquid restrictions may be the only treatment for moderate or asymptomatic hyponatremia.
- Administration of sodium chloride may be indicated.

Dialysis

Dialysis is a form of treatment for patients whose kidneys are deteriorating. When people develop kidney problems, their kidneys are less competent in filtering the blood. As a result, wastes and toxins build in the bloodstream. With dialysis, kidney remove excess water and wastes from circulation. In situations of kidney failure or end-stage renal disease, dialysis could be necessary (ESRD). Lupus, diabetes, high blood pressure, and other conditions and accidents can result in kidney damage. [26 – 31]

Types of Dialysis

There are two ways of dialysis:

- Hemodialysis.
- Peritoneal dialysis.

Renal Transplantation
Some individuals with end-stage renal illness can live normal, and frequently extended, lives because to this surgical technique.

- To reduce the chance of transplant rejection and failure, histocompatibility must be assessed.
- To evaluate histocompatibility, the types of blood groups, mixed lymphocyte reactivity, and human leukocyte antigen (HLA) are identified.
- Both cadavers and living donors are acceptable sources of material for renal transplants.
- Graft rejection can take three different forms.
    - Graft loss occurs minutes to hours after transplantation due to hyper acute(immediate) rejection.
    - Hyper acute rejection is indicated intra operatively by acute stoppage of urine flow and bluish or mottled kidney discoloration.
    - Postoperative complications may include hypertension, renal enlargement, pyrexia decreased urine output, local discomfort, and sodium retention.
    - Hyper acute rejection is treated right away. Nephrectomy
- Acute rejection may occur after transplantation (4 to 60 days)
- More than 60 days following the transplant, chronic rejection starts to happen.
- Mild fever, elevated proteins in urine, hypertension, oliguria, weight gain, and edema are some of the consequences. [33]

Complications [35]

- Hypertension
- Cardiovascular problems
- Anemia
- CKD-related mineral bone disorder
- Salt and water retention
- Metabolic acidosis and electrolyte disorders
- Uremic symptoms

Prevention

- Manage Underlying Conditions
- Stop Smoking
- Healthy Diet
- Manage Alcohol Intake
- Exercise Regularly
- Be Careful with Painkillers
- Avoiding Certain Substances
- Prevention Among At-Risk Groups

Aims & Objective

- To Categorize the Demographic attributes of the CKD patients.
- To Study and Evaluate the diagnosis in etiological aspect of CKD Patients.
- To Study and Evaluate the Symptoms of CKD Patients.
- To Study and Evaluate the Different stages of CKD Patients.
- To Study and Evaluate the Abnormal Lab parameters in Patients with CKD.
- To Study and Evaluate the classes of drugs used to treat the CKD patients.

MATERIALS AND METHODS

Study Design
An Observational and Cross-sectional Study.

Inclusion Criteria

- Patients of either gender, age greater than or equal to18 years

- Patients with old or newly diagnosed CKD
- Patients who are willing to participate in this study
- Patients with or without different comorbidities
- Both inpatients and outpatients eligible.

Exclusion Criteria

- Patients age below 18 years
- Patients who are not willing to participate in this study
- Pregnancy and lactating women

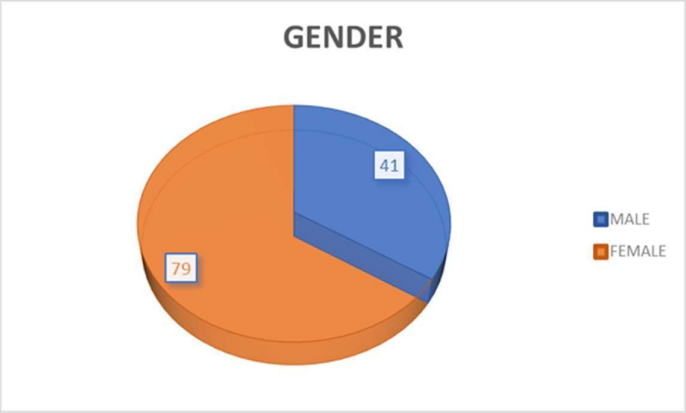
Data Collection and Assessment of Study Observations

- To collect data from patients and medical records, a valid and reliable form tailored to each patient was developed.
- Student investigators constructed the profile form, which was validated through many standard publications.
- The patient's demographic information (age, weight, and sex), prescribed medications, lab values are all included in the data collection form.

RESULTS

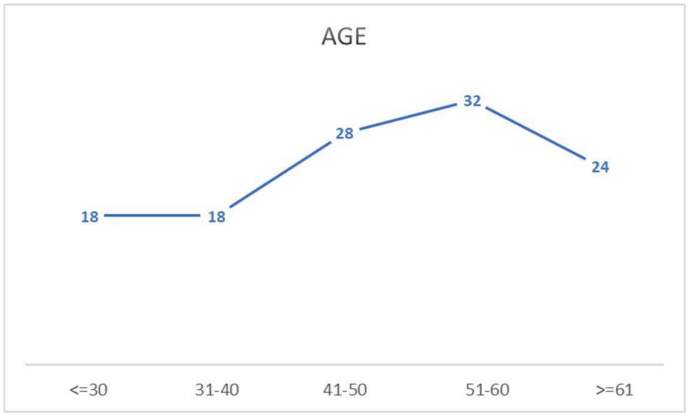
Result 1: Distribution according to gender

Gender	No of Patients	Percentage
Female	79	34.2
Male	41	34.2



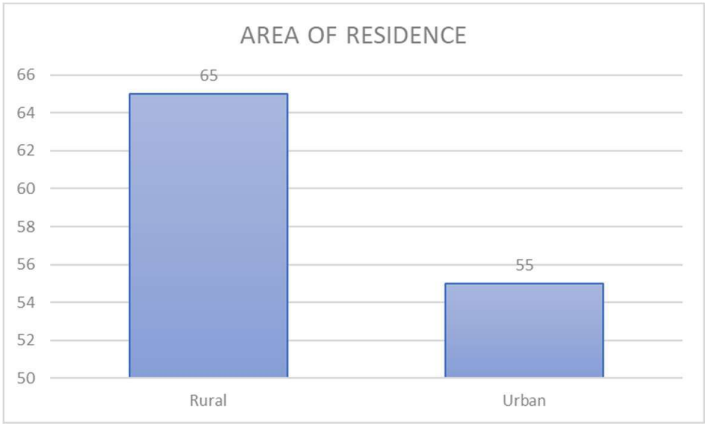
Result 2: Distribution according to age

Age	No of Patients	Percentage
Less than 30 years	18	15.0
31-40 years	18	15.0
41-50 years	28	23.3
51-60 years	32	26.7
Above 61 years	24	20.0



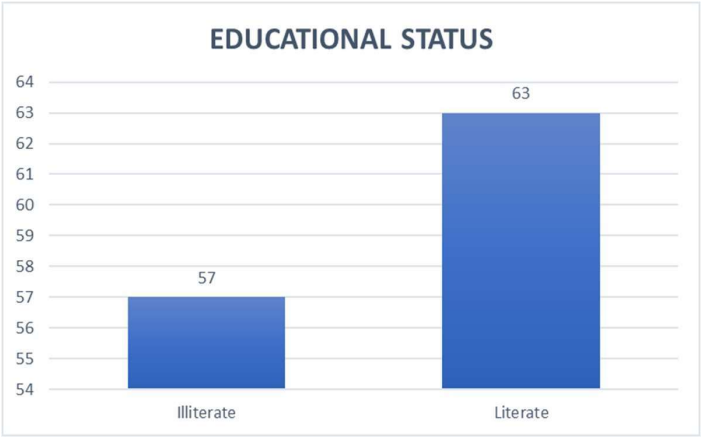
Result 3: Distribution according to area of residence

Area of Residence	No of Patients	Percentage
Rural	65	54.2
Urban	55	45.8



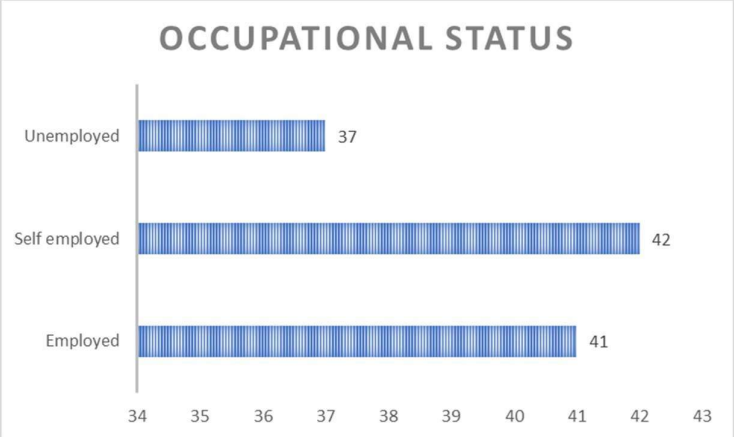
Result 4: Distribution according to educational status

Educational Status	No of Patients	Percentage
Literate	63	52.5
Illiterate	57	47.5



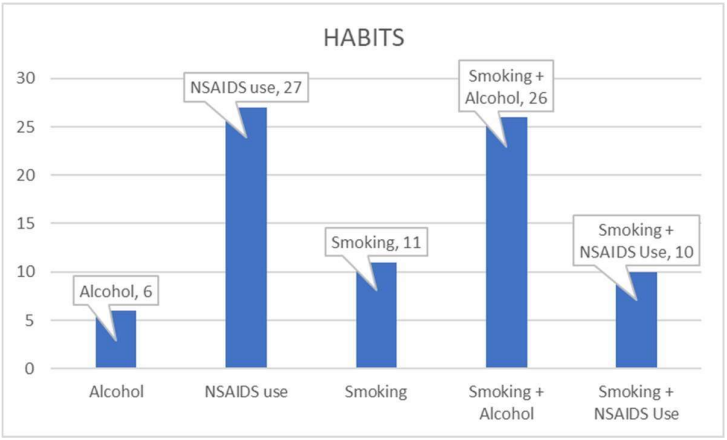
Result 5: Distribution according to occupational status

Occupational Status	No of Patients	Percentage
Employed	41	34.2
Unemployed	42	35.0
Self Employed	37	30.8



Result 6: Distribution According to Habits

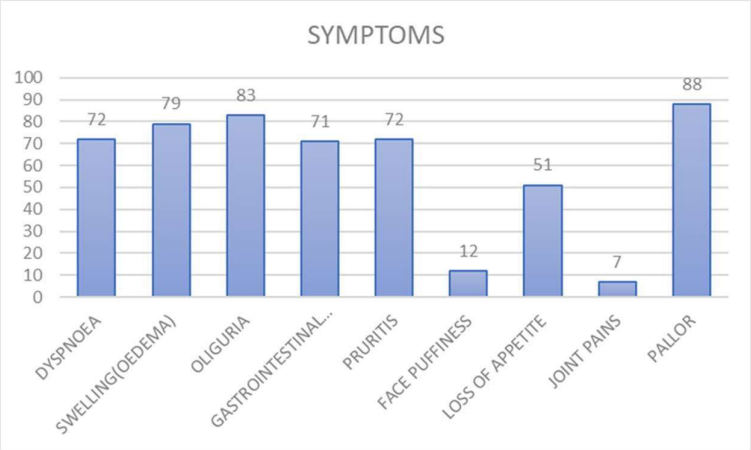
Habits	No of Patients	Percentage
Alcohol	6	5.0
NSAID's	27	22.5
Smoking	11	9.2
Smoking + Alcohol	26	21.7
Smoking + NSAID's	10	8.3



Result 7: Distribution according to the clinical features

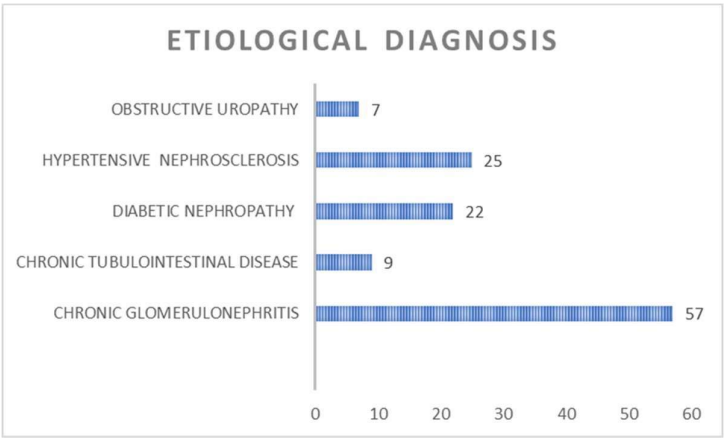
Clinical Features	No of Patients	Percentage
Dyspnoea	72	60.0
Swelling (Edema)	79	65.8
Oliguria	83	69.2
GI Disturbances	71	59.2
Pruritis	72	60.0
Facial Puffiness	12	10.0

Loss of Appetite	51	42.5
Joint Pains	7	5.8
Pallor	88	73.3



Result 8: Distribution according to etiological diagnosis

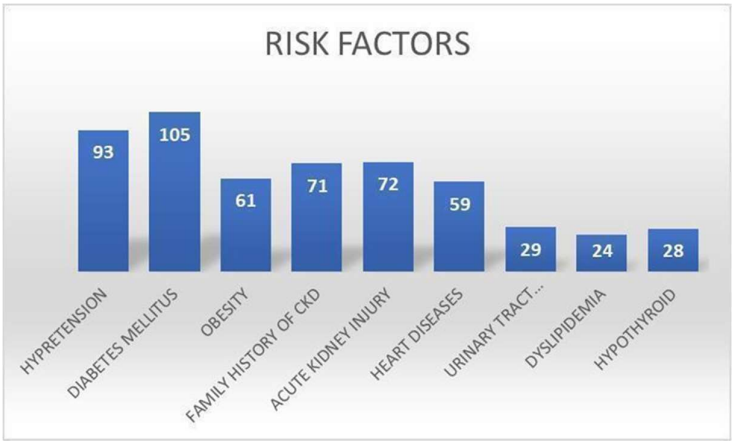
Etiological Diagnosis	No of Patients	Percentage
Chronic Glomerulonephritis	57	47.5
Chronic Tubulointestinal Disease	9	7.5
Diabetic Nephropathy	22	18.3
Hypertensive Nephrosclerosis	25	20.8
Obstructive Uropathy	7	5.8



Result 9: Distribution According to Risk Factors

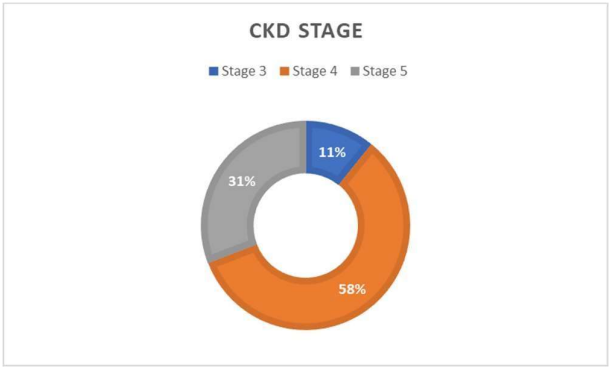
Risk Factors	No of Patients	Percentage
Hypertension	93	77.5
Diabetes Mellitus	105	87.5
Obesity	61	50.8
Family History of CKD	71	59.2
AKI	72	60.0

Heart Diseases	59	49.2
UTI	29	24.2
Dyslipidemia	24	20.0
Hypothyroid	28	23.3



Result 10: Distribution according to CKD Stage

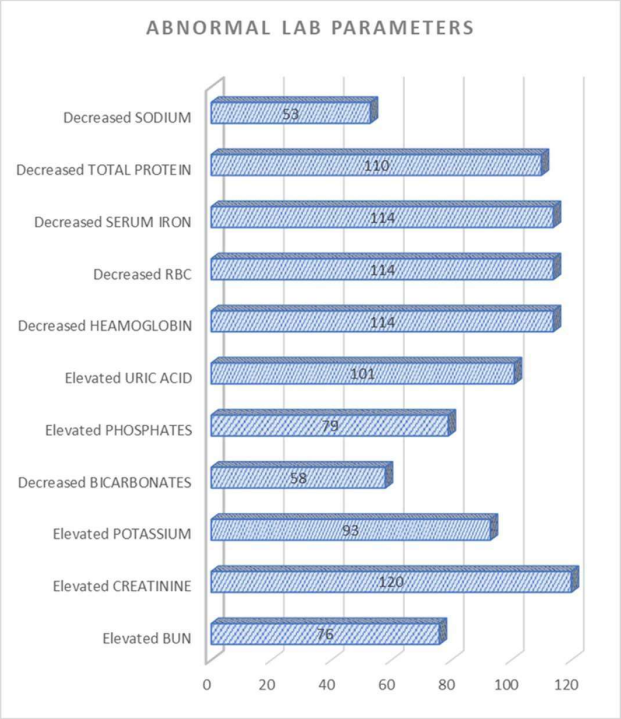
CKD Stage	No of Patients	Percentage
1	0	0
2	0	0
3	13	10.8
4	70	58.3
5	37	30.8



Result 11: Distribution of patients according to abnormal lab parameters

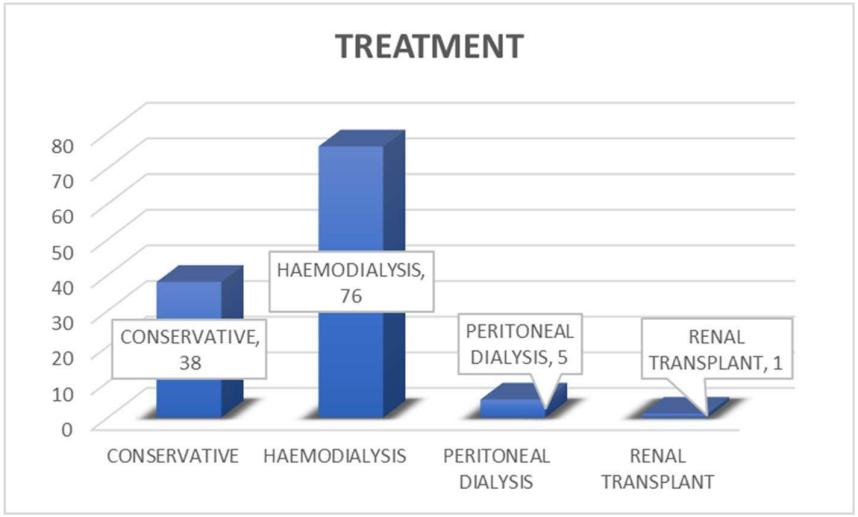
Lab Investigations	No of Patients	Percentage
Elevated BUN	76	63.3
Elevated Creatinine	120	100.0
Elevated Potassium	93	77.5
Decreased Bicarbonates	58	48.3
Elevated Phosphates	79	65.8
Elevated Uric Acid	101	84.2
Decreased Haemoglobin	114	95.0
Decreased RBC	114	95.0

Decreased Serum Iron	114	95.0
Decreased Total Protein	110	91.7
Decreased Sodium	53	44.2



Result 12: Treatment of CKD Patients

Treatment	No of Patients	Percentage
Conservative	38	31.7
Hemodialysis	76	63.3
Peritoneal Dialysis	5	4.2
Renal Transplant	1	0.8

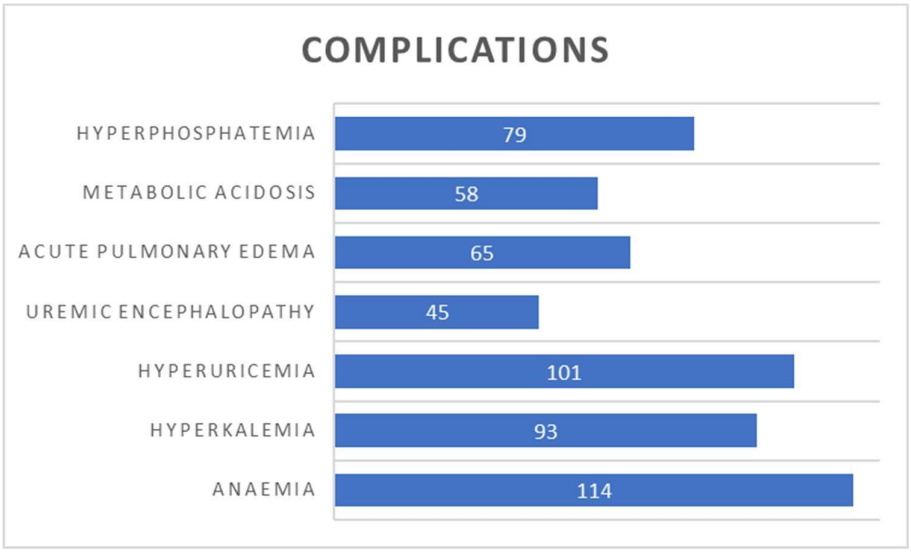


Result 13: Drugs classes used to treat CKD

Drug Class	Drug Name	Dose	No of Patients	Percentage
Anti-Hypertensives	Cardivas	3.125 mg	99	82.5
Anti-Hyperglycemics	Glycomet SR	1000 mg	105	87.5
Hypolipidemics	Atorvas	10 mg	38	31.7
Antiplatelets	Clopidogrel	75 mg	59	49.2
Diuretics	Dytor	20 mg	72	60.0
Thyroid Drugs	Thyronorm	150 mcg	28	23.3
Antibiotics	Norflox	400 mg	120	100.0
Haemopoietic Agents	Epoetin Alfa	100 U	114	95.0
Vitamins	Limcee	500 mg	120	100.0
Phosphate Binders	Renevla	800 mg	79	65.8
Electrolytes	Calcium Gluconate	100 mg/ml	58	48.3
Antiemetics	Zofer	4 mg	68	56.7
Antacid	Pan D	40 mg	120	100.0
Steroids	Prednisone	4 mg	41	34.2
Analgesic/Antipyretic	Dolo	650 mg	20	16.7
Laxative	Duphalac	30 ml	9	7.5
Bronchodilator	Montair	10 mg	124	103.3
Sedatives	Ativan	2 mg	120	100.0

Result 13: Distribution according to Complications

Complications	No of Patients	Percentage
Anemia	114	95.0
Hyperkalemia	93	77.5
Hyperuricemia	101	84.2
Uremic Encephalopathy	45	37.5
Acute Pulmonary Edema	65	84.2
Metabolic Acidosis	58	77.5
Hyperphosphatemia	79	95.0



DISCUSSIONS

Chronic kidney disease (CKD) is defined by a progressive deterioration in renal function over a period of three months to years. CKD is a worldwide public health problem, both for the number of patients and cost of treatment involved. Diabetes and hypertension are major risk factors for the onset and advancement of CKD. The study of drug use patterns is necessary to promote rational drug use in developing countries. Gender: In this investigation, among the individuals from the study population that is 120 members, most of them were females followed by males. Age: In this study, CKD was increasingly observed in the age group 51 to 60, which was then observed by 41-50, >=61, 31 to 40 and <=300 age groups. The mean age of patients in this study is 48 yrs.

Area of residence: In this study most of the patients were from rural area followed by urban area Habits: Within research, most of the people who were included in the study population were tend to have smoking habit followed by alcohol and some of the patients were using NSAIDs.

Clinical features: The most frequently clinical feature observed in CKD patients was pallor followed by oliguria dyspnea, edema, GI Disturbances, Pruritus, Loss of appetite, Fatigue, Face puffiness, and Joint pains.

Etiological diagnosis: From the research, the most common etiological identification was observed in CKD patients was chronic glomerulonephritis followed by chronic tubulointestinal disease, diabetic nephropathy, hypertensive nephrosclerosis and obstructive uropathy.

Risk factors: In this study, the most occurring risks in CKD patients was Diabetes mellitus followed by Hypertension, Obesity, Acute kidney injury, Heart diseases, and Family history of CKD, Hypothyroid, Urinary tract infections, and Dyslipidemia.

CKD stage: In this investigation most of the patients were found to be having CKD Stage 4 followed by CKD Stage and CKD Stage 3.

Abnormal lab parameters: In this study, various types of abnormal laboratory parameters were observed. Most of the patients were presented with increased Creatinine, which was further followed By a decline in Hemoglobin level, Decreased RBC, Decreased Iron, Decreased Total protein, Elevated Uric acid, Elevated BUN, Elevated Potassium, reduced Sodium, Elevated Phosphates, Decreased Bicarbonates.

Treatment of CKD patients: In this research, 31.7% patients received conservative care, 63.3% were receiving hemodialysis, 4.2% were using peritoneal dialysis and 0.8% patients had renal transplantation

Drugs used to treat CKD: In this study, different classes of drugs were used for the treatment of CKD patients. Classes of drugs include antihypertensive drugs, anti-hyperglycemic, hypolipidemic, antiplateletics, diuretic, thyroid drugs, antibiotics were administered to the CKD patients. Drugs used were amoxyclav, cefixime, ceftriaxone, anemic drugs, vitamin supplements, phosphate binders, sodium bicarbonate, ondansetron, metoclopramide, antacids drugs, prednisolone, theophylline, alprazolam and clonazepam.

Complications: During this research, multiple problems were observed in CKD patients. Most of the patients had anemia followed by hyperuricemia, hyperkalemia, hyperphosphatemia, metabolic acidosis, uremic encephalopathy and acute pulmonary edema.

CONCLUSION

This study highlights the significant public health issue of Chronic Kidney Disease (CKD) in India, primarily affecting adults, with females having a higher prevalence. Common symptoms include pallor, oliguria, dyspnea, edema, and joint aches. Common risk factors include diabetes, hypertension, obesity, and acute renal damage. Hemodialysis is a life-saving therapy for end-stage CKD patients. This study examined prescribing trends in CKD care treatment, finding antihyperglycemic medications, antihypertensive medications, blood-forming agents, and nutritional supplements most commonly used. Monitoring risky individuals, lifestyle modifications, physical exercise, and quitting smoking can reduce disease occurrence and ensure timely treatment, longevity, and rehabilitation.

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