R e s e a r c h   A r t i c l e

A Study on Evalaution of Prescribing Pattern of Drugs used in Nephrology Department in a Tertiary care Hospital

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A B S T R A C T

Chronic kidney disease affects between 8% and 16% of the population worldwide and is often under recognized by patients and clinicians. The present study aimed to evaluate the prescribing pattern of drugs used in nephrology department in a tertiary care hospital. The prospective observational study was carried out for a period of 6 months. The study was conducted in a Nephrology department in a tertiary care hospital. A Total of 210 patients were enrolled in the study. The duration of renal disease includes 1-4 years duration renal disease patients were more 93(44.28%) as compared to other renal disease durations. Diabetes mellitus disease comorbid condition disease patients were more 74(35.23%) as compared to other comorbid conditions. Peritoneal dialysis patients were more 117(55.71%) as compared to other dialysis procedures. Calcium supplements prescribed patients were more 49(23.33%) as compared to other prescribed drugs. The regular education of the health care prescribers and dissemination of treatment guideline could facilitate rational use of drugs and adherence to treatment guidelines. The study concluded that most of the patients included in the study were suffering from chronic kidney disease. These may be due to their food habits, smoking, less exercise and poor health hygiene. Thus, CKD progression may differ depending on sex. Early recognition with timely initiation of treatment in collaboration with nephrologists will improve the care for CKD patients and the physicians play an important outcome in patients with CKD.

Keywords: Chronic kidney disease, peritoneal dialysis, regular education, Calcium supplements.

A r t i c l e   I n f o

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C O N T E N T S

1. Introduction

Chronic kidney disease (CKD) affects between 8% and 16% of the population worldwide and is often under recognized by patients and clinicians. Defined by a glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m^2, albuminuria of at least 30 mg per 24 hours, or markers of kidney damage (eg, hematuria or structural abnormalities such as polycystic or dysplastic kidneys) persisting for more than 3 months, CKD is more prevalent in low- and middle-income than in high-income countries. Globally, CKD is most commonly attributed to diabetes and/or hypertension, but other causes such as glomerulonephritis, infection, and environmental exposures (such as air pollution, herbal remedies, and pesticides) are common in Asia, sub-Saharan Africa, and many developing countries.[4] Genetic risk factors may also contribute to CKD risk. For example, sickle cell trait and the presence of 2 *APOL1* risk alleles, both common in people of African ancestry but not European ancestry, may double the risk of CKD. In the United States, the average rate of GFR decline is approximately 1 mL/min/1.73 m^2 per year in the general population, and the lifetime risk of developing a GFR of less than 60 mL/min/1.73 m^2 is more than 50%. Early detection and treatment by primary care clinicians is important because progressive CKD is associated with adverse clinical outcomes, including end-stage kidney disease (ESKD), cardiovascular disease, and increased mortality. Recent professional guidelines suggest a risk-based approach to the evaluation and management of CKD. This review includes discussion of new calculators for determining risk of CKD progression that may be useful in clinical practice and focuses on the diagnosis, evaluation, and management of CKD for primary care clinicians[1-5]. The term renal failure denotes the inability of the kidneys to perform excretory function leading to retention of nitrogenous waste products from the blood. Functions of the kidney are as follows:

- Electrolyte and volume regulation
- Excretion of nitrogenous waste
- Elimination of exogenous molecules, for example, many drugs
- Synthesis of a variety of hormones, for example, erythropoietin
- Metabolism of low molecular weight proteins, for example, insulin
- Acute and chronic renal failure are the two kinds of kidney failure.

Acute Renal Failure (ARF)

ARF is the syndrome in which glomerular filtration declines abruptly (hours to days) and is usually reversible. According to the KDIGO criteria in 2012, AKI can be diagnosed with any one of the following: (1) creatinine increase of 0.3 mg/dL in 48 hours, (2) creatinine increase to 1.5 times baseline within last 7 days, or (3) urine volume less than 0.5 mL/kg per hour for 6 hours.

Chronic Renal Failure (CRF)

CRF or chronic kidney disease (CKD) is defined as a persistent impairment of kidney function, in other words, abnormally elevated serum creatinine for more than 3 months or calculated glomerular filtration rate (GFR) less than 60 ml per minute / 1.73m2. It often involves a progressive loss of kidney function necessitating renal replacement therapy (dialysis or transplantation). When a patient needs renal replacement therapy, the condition is called end-stage renal disease (ESRD).

CKD classified based on grade:
- Grade 1: GFR greater than 90
- Grade 2: 60 to 89
- Grade 3a: 45 to 59
- Grade 3b: 30 to 44
- Grade 4: 15 to 29
- Grade 5: Less than 15
- CKD classified based on stage:
- Stage 1: GFR greater than 90
- Stage 2: 60 to 89
- Stage 3: 30 to 59
- Stage 4: 15 to 29
- Stage 5: Less than 15

Etiology

Acute Renal Failure

Prerenal (approximately 60%): Hypotension, volume contraction (e.g., sepsis, hemorrhage), severe organ failure such as heart failure or liver failure, drugs like non-steroidal anti-inflammatory drugs (NSAIDs), angiotensin receptor blockers (ARB) and angiotensin-converting enzyme inhibitors (ACEI), and cyclosporine[6-10]. Intrarenal (approximately 35%): Acute tubule necrosis (from prolonged prerenal failure, radiographic contrast material, drugs like aminoglycosides, or nephrotoxic substances), acute interstitial nephritis (drug-induced), connective tissue disorders (vasculitis), arteriolar insults, fat emboli, intrarenal deposition (seen in tumor-lysis syndrome, increased uric acid production and multiple myeloma-Bence-Jones proteins), rhabdomyolysis
Postrenal (approximately 5%): Extrinsic compression (prostatic hypertrophy, carcinoma), intrinsic obstruction (calculus, tumor, clot, stricture), decreased function (neurogenic bladder)

Chronic Renal Failure

Diabetes mellitus, especially type 2 diabetes mellitus, is the most frequent cause of ESRD.
- Hypertension is the second most frequent cause.
- Glomerulonephritis
- Polycystic kidney diseases
- Renal vascular diseases
- Other known causes, like prolonged obstruction of the urinary tract, nephrolithiasis
- Vesicoureteral reflux, a condition in which urine to back up into the kidneys
- Recurrent kidney infections/ pyelonephritis

- Unknown etiology

Epidemiology

The incidence of AKI has been cited as 1% on hospital admission, 2% to 5% during hospitalization, and in as many as 37% of patients treated in intensive care units (ICUs), and in 4% to 15% of patients after cardiovascular surgery. Overall, the incidence of AKI has been estimated to be 209 patients per million population per year, with 36% of patients with AKI requiring renal replacement therapy. The incidence and prevalence of CRF in the United States are uncertain. The third National Health and Nutrition Examination Survey (NHANES III) shows that almost 2 million people in the United States have a serum creatinine level of 2 mg/dl or greater. CRF is known to be more prevalent in men than in women. This gender disparity extends to ESRD.ESRD develops in over 100,000 persons a year in the United States. Rates of ESRD vary with race[11-15].

Treatment / Management

Treatment options for renal failure vary widely and depend on the cause of failure. Broadly options are divided into two groups: treating the cause of renal failure in acute states versus replacing the renal function in acute or chronic situations and chronic conditions. Below is the summary of renal failure treatment.

Acute Renal Failure

Mainstay is treating the underlying cause and associated complications

In case of oliguria and no volume, overload is noted, a fluid challenge may be appropriate with diligent monitoring for volume overload. In the case of hyperkalemia with ECG changes, IV calcium, sodium bicarbonate, and glucose with insulin should be given. These measures drive potassium into cells and can be supplemented with polystyrene sulfonate, which removes potassium from the body. Hemodialysis is also an emergency method of removal.

Oliguric patients should have a fluid restriction of 400 mL + the previous day's urine output (unless there are signs of volume depletion or overload).

If acidosis: Serum bicarbonate intravenous or per oral, versus emergency/urgent dialysis based on the clinical situation

General Measures

First things first, always review the drug list.

Stop nephrotoxic drugs and renally adjust others. Many supplements not approved by the FDA can be nephrotoxic.

Treat infections aggressively.

- Immediate Dialysis Indications
- Severe hyperkalemia
- Acidosis
- Volume overload refractory to conservative therapy
- Uremic pericarditis
- Encephalopathy
- Alcohol and drug intoxications
- Chronic Renal Failure

Interventions to slow the progression of CKD[16-18]

- Reduce intra-glomerular filtration
- Reduce proteinuria; effective meds include ACE/ARB
- Strict glycemic control
- Prevent and treat complications of CKD
- Discuss renal replacement therapy with patients appropriately and timely
- Periodically review medications and avoid nephrotoxic medicines. Dose renally excreted medications appropriately.

Differential Diagnosis

- Acute kidney injury
- Alport Syndrome
- Antiglomerular Basement membrane disease
- chronic glomerulonephritis
- Diabetic neuropathy
- Multiple Myeloma
- Nephrolithiasis
- Nephrosclerosis

Complications

- Volume overload
- Hyponatremia
- Hyperkalemia
- Acidosis
- Calcium and phosphate balance
- Anemia
- Go to:
- Consultations

Treating complications

- **High blood pressure medications.** People with kidney disease can have worsening high blood pressure. Your doctor might recommend medications to lower your blood pressure commonly angiotensin-converting enzyme (ACE) inhibitors or angiotensin II receptor blockers and to preserve kidney function. High blood pressure medications can initially decrease kidney function and change electrolyte levels, so you might need frequent blood tests to monitor your condition.
- **Medications to relieve swelling.** People with chronic kidney disease often retain fluids. This can lead to swelling in the legs as well as high blood pressure. Medications called diuretics can help maintain the balance of fluids in body.
- **Medications to treat anemia.** Supplements of the hormone erythropoietin (uh-rith-roe-POI-uh-tin), sometimes with added iron, help produce more red blood cells. This might relieve fatigue and weakness associated with anemia.
- **Medications to lower cholesterol levels:** People with chronic kidney disease often have high levels of bad cholesterol, which can increase the risk of heart disease.

- **Medications to protect your bones.** Calcium and vitamin D supplements can help prevent weak bones and lower risk of fracture.
- **A lower protein diet to minimize waste products in your blood.** As body processes protein from foods, it creates waste products that your kidneys must filter from your blood. To reduce the amount of work kidneys must do, your doctor might recommend eating less protein.

Treatment for end-stage kidney disease

- **Dialysis.** Dialysis artificially removes waste products and extra fluid from your blood when kidneys can no longer do this. In hemodialysis, a machine filters waste and excess fluids from your blood.
  In peritoneal dialysis, a thin tube inserted into your abdomen fills your abdominal cavity with a dialysis solution that absorbs waste and excess fluids. After a time, the dialysis solution drains from body, carrying the waste with it.
- **Kidney transplant.** A kidney transplant involves surgically placing a healthy kidney from a donor into body. Transplanted kidneys can come from deceased or living donors.

2. Methodology

The prospective observational study was carried out for a period of 6 months. The study was conducted in a Nephrology department in a tertiary care hospital. A written and informed consent was obtained from the recruited patients. A Total of 210 patients were enrolled in the study.

Study Design: It was Prospective observational study.

Study Period: The Present study was conducted for a period of six months.

Study site:

The Present study was conducted in a Nephrology department in a tertiary care hospital.

Sample size: It was 210 Patients.

Inclusion criteria

- Patients with renal abnormalities.
- Patients of either sex, diagnosed with renal abnormalities.
- Patients who are willing to give consent.
- Patients receiving treatment for renal abnormalities.
- Patients with clinical profile of renal abnormalities.

Exclusion criteria

- Patients below 18 years.
- Patients who are not diagnosed with gastro intestinal abnormalities.
- Special population including pregnant women and lactating women.
- Psychiatric abnormalities.
- Patients who were not willing to join in the study.

Institutional ethics committee (IEC) consideration:

The research protocol was submitted to ethical committee and ethical Committee was permitted to perform the research work in the Nephrology department.

Patient data collection and management:

The data collection form contains information regarding age, sex, diagnosis, past medical history, laboratory data, and diagnostic results. The information about risk factors, clinical laboratory reports, treatment, dose and frequency of administration and duration of therapy was collected from the patients treatment chart.

Statistical analysis:

The data was represented as percentages. The $P<0.05$ was considered to indicate a statistically significant difference.

3. Results and Discussion

Table 1: Age

30-32 years age patients were 33 (15.71%),33-34 years age patients were 29 (13.80%), 35-45 years age patients were 44(20.95%),46-56 years age patients were 56(26.66%), 57-60 years age patients were 48(22.85%).

S.No	Age (Years)	Total N=210	Percentage (%)
1.	30-32	33	15.71
2.	33-34	29	13.80
3.	35-45	44	20.95
4.	46-56	56	26.66
5.	57-60	48	22.85
	Total	**210**	

Table 2: Gender

In our study Male patients were 162(77.14%), Female patients were 48(22.85%).

S.No	Gender	Total N=210	Percentage (%)
1	Males	162	77.14
2	Female	48	22.85
	Total	**210**	

Table 3: GFR rate

60-89 range GFR patients was 43(20.47%), 30-59 range GFR patients was 51(24.28%),15-29 range GFR patients was 40(19.04%),<15 range GFR patients was 76(36.19%).

S.No	GFR (ml/min/1.73m2)	Total N=210	Percentage (%)
1.	60-89	43	20.47
2.	30-59	51	24.28
3.	15-29	40	19.04
4.	<15	76	36.19
	Total	210	

Table 4: Risk factors of renal diseases

Risk factors of renal diseases include Hepatitis patients were 36(17.14%),NSAID patients were 41(19.52%), Renal stones patients were 59(28.09%),Obesity patients were 74(35.23%).

S.No	Risk factors	Total N=210	Percentage (%)
1.	Hepatitis	36	17.14
2.	NSAID	41	19.52
3.	Renal stones	59	28.09
4.	Obesity	74	35.23
	Total	210	

Table 5: Clinical symptoms of renal disease

The clinical symptoms of renal disease includes Edema patients were 25(11.90%), Joint pain patients were 56(26.66%), Breathlessness patients were 62(29.52%), Chest pain patients were 49(23.33%), GIT disturbances patients were 18(8.57%).

S.No	Clinical symptoms	Total N=210	Percentage (%)
1	Edema	25	11.90
2	Joint pain	56	26.66
3	Breathlessness	62	29.52
4	Chest pain	49	23.33
5	GIT disturbances	18	8.57
	Total	210	

Table 6: Duration of renal disease

The duration of renal disease includes 1-4 years patients were 93(44.28%), 5-6 years patients were 43(20.47%), 7-8 years patients were 74(35.23%).

S.No	Duration	Total N=210	Percentage (%)
1	1-4 years	93	44.28
2	5-6 years	43	20.47
3	7-8 years	74	35.23
	Total	210	

Table 7: Comorbidities

The Comorbidities includes Hypertension disease patients were 56(26.66%), Diabetes mellitus disease patients were 74(35.23%), Heart failure disease patients were 32(15.23%), Anemia disease patients were 48(22.85%).

S.No	Comorbidities	Total N=210	Percentage (%)
1	Hypertension	56	26.66
2	Diabetes mellitus	74	35.23
4	Heart failure	32	15.23
5	Anemia	48	22.85
	Total	210	

Table 8: Dosage forms

The Dosage forms includes Tablet dosage form patients were 53(25.23%), Injection dosage form patients were 42(20%), Capsule dosage form patients were 77(36.66%), Syrup dosage form patients were 38(18.09%).

S.No	Dossage forms	Total N=210	Percentage (%)
1	Tablet	53	25.23
2	Injection	42	20
3	Capsule	77	36.66
4	Syrup	38	18.09
	Total	**210**	

Table 9: Medications Per Prescription

The Medications Per Prescription includes 1-4 medications prescribed patients were 86(40.95%), 5-9 medications prescribed patients were 55(26.19%), 10-12 medications prescribed patients were 69(32.85%).

S.No	Medications Per Prescription	Total N=210	Percentage (%)
1	1--4	86	40.95
2	5--9	55	26.19
3	10--12	69	32.85
	Total	**210**	

Table 10: Dialysis patients

The Dialysis patients includes Hemodialysis patients were 93(44.28%), Peritoneal dialysis patients were 117(55.71%).

S.No	Dialysis	Total N=210	Percentage (%)
1	Hemodialysis	93	44.28
2	Peritoneal dialysis	117	55.71
	Total	**210**	

Table 11: Prescribing pattern of drugs in renal diseases

ACE inhibitors prescribed patients were 40(19.04%),Diuretics prescribed patients were 25(11.90%), Statins prescribed patients were 24(11.42%),Vitamin-D prescribed patients were 22 (10.47%), Calcium supplements prescribed patients were 49(23.33%), Phosphate binders prescribed patients were 20(9.52%), Erythropoietin prescribed patients were 30(1.09%).

S.No	Prescribing pattern of drugs	Total N=210	Percentage (%)
1	ACE inhibitors	40	19.04
3	Diuretics	25	11.90
4	Statins	24	11.42
5	Vitamin-D	22	10.47
6	Calcium supplements	49	23.33
7	Phosphate binders	20	9.52
8	Erythropoietin	30	1.09
	Total	**210**	

Discussion

- In our study 46-56 years age patients were more 56(26.66%) as compared to other age group patients.
- In our study Male patients were more 162(77.14%) as compared to female patients.
- <15 range of GFR patients was more 76(36.19%) as compared to other ranges.
- Obesity risk factor patients were more 74(35.23%) as compared to other renal diseases risk factors.
- Breathlessness clinical symptom patients were 62(29.52%) as compared to other clinical symptoms.
- The duration of renal disease includes 1-4 years duration renal disease patients were more 93(44.28%) as compared to other renal disease durations.
- Diabetes mellitus disease comorbid condition disease patients were more 74(35.23%) as compared to other comorbid conditions.
- Capsule prescribed dosage form patients were more 77(36.66%) as compared to other dosage forms.
- The Medications Per Prescription includes 1-4 medications prescribed patients were more 86(40.95%) as compared to other prescribed drugs.
- Peritoneal dialysis patients were more 117(55.71%) as compared to other dialysis procedures.
- Calcium supplements prescribed patients were more 49(23.33%) as compared to other prescribed drugs[19].

4. Conclusion

The kidney disease outcome quality initiative characterizes chronic kidney disease (CKD) as either damage of the kidney or diminished glomerular filtration pace of <60ml/min/1.73m2 for a long time[20]. CKD is a worldwide threat to health for developing nations specifically in light of increasing incidence, insignificant outcome and expenses of the treatment. The study concluded that most of the patients included in the study were suffering from chronic kidney disease. These may be due to their food habits, smoking, less exercise and poor health hygiene. Thus, CKD progression may differ depending on sex. Early recognition with timely initiation of treatment in collaboration with nephrologists will improve the care for CKD patients and the physicians and Nephrologists play an important outcome in patients with CKD.

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