ORIGINAL ARTICLE

To Evaluate the Hypertension, Diabetes, and Urinary Tract Infection Anemia Effect on Kidney Function a Retrospective-based Study

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Abstract

Aim: Few researches have been done on the effects of various illnesses on renal function. This key aspect is taken into account for the conduct of our study, and it aids in the continuation of our research and provides a brief overview of the prevalence and predominance of renal failure. The types of renal damage that are more common were described in relation to diseases, age, sex, and social behavior to rule out diseases that cause renal damage. **Methodology:** At the Suraksha Hospital in Andhra Pradesh's nephrology department, a non-experimental prospective observational study was carried out. The duration of the study was roughly 3 years. In the study, 1000 patients were included depending on their diseases, age, sex, and social behavior. **Results:** Our research identified disorders that affect renal function. Males are more likely to have disorders that affect kidney function, and the 50–70 age bracket is particularly important. Diabetes mellitus (DM) left untreated impairs kidney function. **Conclusions:** Data show that patients between the ages of 50 and 70 were most affected, whereas those older than 70 were less affected. There were 1000 individuals diagnosed with a renal injury, and out of those, 600 (or 60%) were men and 400 (or 40%) were women. Out of 1000 individuals with renal failure, 625 are located in rural areas, whereas 375 are located in urban areas. DM patients (680, or 68%), hypertension (190, or 19%), urinary tract infection (100, or 10%), and anemia (3%) are the conditions that cause kidney failure.

Key words: Age groups, diabetes mellitus, high blood pressure, kidney failure, nephrology department and social customs, patients

INTRODUCTION

Renal failure: A condition in which the kidneys lose the ability to remove waste and fluids from the body. Renal failure is two types: (1) acute renal failure and (2) chronic kidney failure.

The abrupt, potentially reversible loss of kidney function that causes the retention of nitrogenous waste products in bodily fluids is known as acute renal failure [Figure 4 and Table 4]. Most frequently, it results from damaged renal tissue caused by a decrease in kidney blood flow.[1,2]

Signs and symptoms

a. Accumulation of urea
b. Fatigue
c. Decreased urine output
d. Chest pain
e. Seizures
f. Shortness of breath.

Causes

a. Dehydration and sepsis
b. Chemotherapy drugs
c. Peripheral artery diseased
d. Age
e. Decreased blood supply to kidney
f. Diabetes

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g. High blood pressure (BP)
h. Blood clots in the urinary tract.

Classification[3-6]

According to KDIGO (kidney disease improving global outcomes), it can be classified as

1. Pre-renal failure
2. Intrinsic failure
3. Post-renal failure

Pre-renal

This stems from reduced arterial blood volume, decreased cardiac output, renal vascular blockage, severe hypotension, and/or renal perfusion impairment.

Intrinsic [Figure 8]

It reflects structural kidney damage that may be brought on by malignant hypertension, acute tubular necrosis, acute glomerulonephritis, acute inflammation, or any combination of these, radiation kidney disease.

Post-renal [Figure 9]

Is brought on by a limitation in the flow of urine anywhere in the urinary tract, including:

a. Ureteral obstruction caused by thrombi or uric acid crystals
b. Bladder blockage caused by tumors or infections such as thrombi
c. Tumors that are causing urethral blockage.

Stages[7,8] [Figure 1 and Table 1]

- Stage 1 (Risk): GFR decreases by 25% or urine output falls below 0.5 mL/kg for 6 h.
- Stage 2 (Injury): GFR drops by 50% or urine production falls below 0.5 mL/kg for 12 h.
- Stage 3 (Failure): GFR drops by 75% or urine production falls below 0.3 mL/kg for 24 h.

The kidneys have completely stopped functioning at Stage 4 (Loss). No urination.

End-stage renal disease (Stage 5): Complete loss of kidney function for more than 3 months.

Pathophysiology[9,10]

Acute renal failure progresses in three phases.

- Phase 1 is initiating phase
- Phase 2 is the maintenance phase
- Phase 3 is the recovery phase.

Initiating phase

a. The period of time between the renal insult and the time when additional renal factors can no longer repair the damage brought on by blockage is known as the starting phase.
b. Urine production may significantly decrease to <400 mL/day to 400 mL/day (oliguria). In some cases [Figure 2 and Table 2], the daily urine output is <100 mL (anuria). Oliguria can last anywhere from a few hours to four to 6 weeks. It displays 40–50%.
c. Blood nitrogenous waste products build up.
d. Azotemia is a sign of urea build up brought on by poor glomerular filtration.
e. Serum levels of organic acids and creatinine rise quickly.
f. Fluid dilution and intracellular fluid shifting cause the serum sodium concentration to fall below normal.
g. The build-up of organic acids causes hyperkalemia. If body potassium levels are high or if potassium consumption is not removed.

Maintenance phase[11,12]

a. After a few days of oliguria, this phase typically begins when urine production rises to 500 cc or more per day.
b. The daily production of urine rises by a few milliliters, reaching 300–500 mL. Urine production may increase by a factor of two daily during the initial stage of recovery.
c. Azotemia and associated test results may persist up to a daily urine production of 1000–2000 mL.
d. During the maintenance phase, there is a danger of fluid and electrolyte imbalances, GI bleeding infection, and respiratory failure.

Recovery phase[13,14]

Renal function gradually resumes during the recovery phase. In the first 2 weeks, most restored renal function becomes apparent. Renal function restoration could last for a full year. Having an aberrant kidney structure for 3 months or more is considered to have chronic kidney disease or chronic renal failure, which might have negative health effects. Albuminuria greater than 30 g/dL, the presence of hematuria in urine sediment, electrolyte abnormalities, and other tubular disorder-related structural abnormalities are examples of structural abnormalities.

Stages of CKD[15,16]

Renal impairment Stage 1 with normal or increased 90 mL/min

- GFR decline in Stage 2: Mild (60–89 mL/min)
- GFR drop in Stage 3 (45–59 mL/min)
- GFR reduction in Stage 3b (30–44 mL/min) is moderate

- GFR drop in Stage 4 (15–29 mL/min)
- Kidney failure Stage 5 (15 mL/min or less)

Signs and symptoms[17,18]

Most in 1st and 3 stages are asymptomatic later stages include
a. Peripheral edema
b. Pulmonary edema
c. Hypertension
d. Nausea
e. Vomiting.

Etiology[19,20]

i. Diabetic kidney disease
ii. Hypertension
iii. Vascular disease
iv. Glomerular disease
v. Cystic kidney disease
vi. Tubulointerstitial disease.

Diabetes mellitus (DM)[21,22] [Figure 7 and Table 7]

A collection of metabolic illnesses known as DM include hyperglycemia and anomalies in the metabolism of carbohydrates, fats, and proteins. There are two types of DM: diabetes types 1 and 2, respectively. The autoimmune disease that causes type 1 diabetes, which frequently manifests in childhood or adolescence and destroys pancreatic beta cells, renders the body totally insulin-deficient. The auto-immunological process is mediated by macrophages and T lymphocytes that have autoantibodies to beta antigens (such as islet cell antibodies and insulin antibodies).

Type II DM, which makes up 90% of cases, is characterized by a mix of relative insulin insufficiency and some degree of insulin resistance. Insulin resistance is characterized by increased hepatic glucose production, increased lipolysis and the synthesis of free fatty acids, as well as decreased skeletal muscle glucose uptake. Diabetes has unusual causes (1–2% of instances), including endocrine issues, gestational DM, exocrine pancreas illnesses such as pancreatitis, and medications such as glucocorticoids, pentamidine, and niacin. Microvascular effects include nephropathy, neuropathy, and retinopathy, for instance. Examples of macrovascular issues include coronary heart disease, stroke, and peripheral vascular disease.[23,24]

Hypertension[25,26]

A consistently increased arterial BP is referred to as hypertension. Adult BP is categorized in the seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high BP (JNC7).

	Systolic blood pressure (mm/hg)	Diastolic blood pressure (mm/hg)
Normal	<120	<80
Prehypertension	120–139	80–89
Stage 1 hypertension	140–159	90–99
Stage 2 hypertension	>160	>100

Diastolic BP levels <90 mm Hg and systolic BP values of 140 mm Hg or more are considered to be isolated systolic hypertension. Hypertensive crisis (BP-180/120 mm Hg) can be classified as either hypertensive urgency (high BP Elevation without acute or progressing target organ injury) or hypertensive emergency (severe BP evaluation with acute or progressive target organ damage).

Anemias[27] [Figure 6 and Table 6]

Definition: A group of diseases known as "anemias" are characterized by a decrease in either hemoglobin (HB) or red blood cells, which reduces the blood's capacity to carry oxygen. Hb values of <12 g/dL (120 g/l; 7.45 mmol/L) in women or <13 g/l (8.07 mmol/L) in men are considered anemic by the World Health Organization. The list of anemias classified functionally can be found in cell size as the basis for morphological categorization. Larger-than-normal cells called macrocytic cells are linked to folic acid or Vitamin B12 deficiency. While normocytic anemia may be brought on by recent blood loss or a persistent illness, microcytic cells are smaller than normal and are linked to iron shortage. Iron deficiency anemia can be brought on by insufficient food consumption, inadequate GI absorption, increased iron demand (such as during pregnancy), blood loss, and chronic disease. Anemias due to Vitamin B12 and folic acid deficiencies can be brought on by insufficient dietary intake, reduced absorption, and insufficient use. Vitamin B12 absorption is lowered when the intrinsic factor is absent.

METHODOLOGY[28-30]

Suraksha hospital is the study location.

Design of the study

This study was a retrospective data.

Sources for the study

All pertinent data were gathered from:
1. First, medical past
2. History of past medication

Table 1: Analysis of gender

Gender	Number of patients
Female	400
Male	600

Table 2: Analysis of age group

Age	Number of patients
>70	180
50-70	560
30-50	260

Table 3: Analysis of smoking and alcohol

Social history	<1 year	1–3 years	>3 years	Nil
Alcohol	40	70	20	380
Smoking	50	60	40	470

Table 4: Serum creatinine analysis

Range	Number of patients
0.7–1.6 mg/dL	150
1.6–3.8 mg/dL	40
3.8–5.6 mg/dL	80
5.6–7.8 mg/dL	80
>7.8 mg/dL	650

Table 5: Blood urea nitrogen analysis

Range	Number of patients
10–45 mg/dL	180
45–90 mg/dL	70
90–180 mg/dL	300
>180 mg/dL	450

Table 6: Analysis of different diseases

Diseases	Number of patients
DM	680
HTN	190
Anemia	30
UTI	100

Table 7: Analysis of urine output

Range	Number of patients
800–2000 mL/day	320
<500 mL/day	580
<100 mL/day	100

3. Age
4. Gender
5. Drinking and smoking

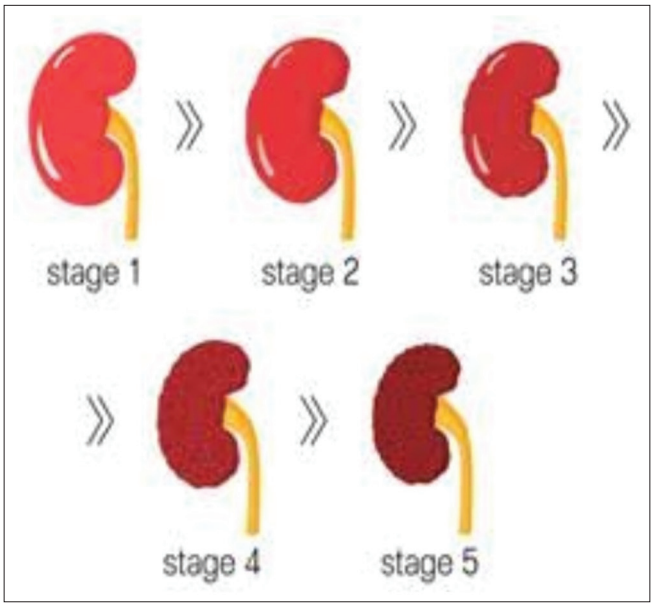

Figure 1: Stages of kidney

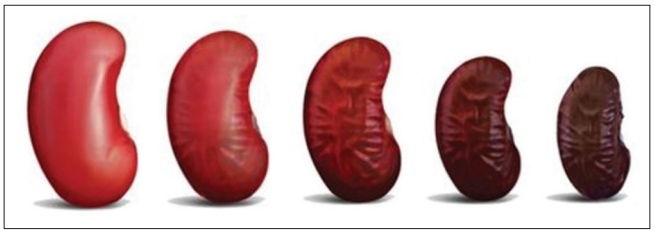

Figure 2: Stages of kidney failure

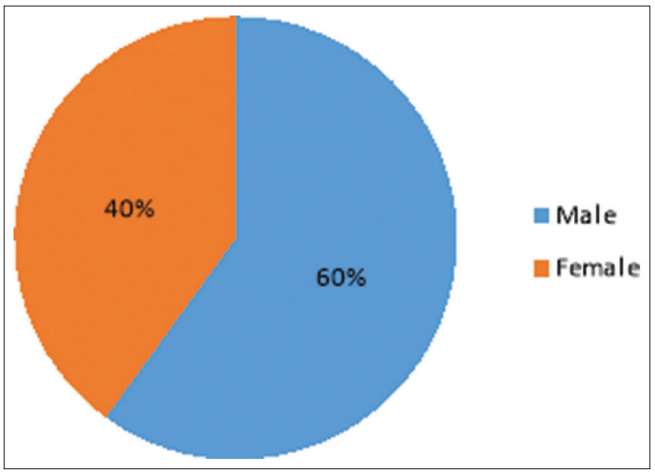

Figure 3: Analysis of gender in a sample population

This study was carried out over a 3-year period in the outpatient and inpatient departments of Suraksha Hospital in Andhra Pradesh, India. All of the patients underwent comprehensive interviews, and sociodemographic information was recorded. These patients' diagnoses were based on their serum creatinine, BUN, and GFR levels. A total of 1000 geriatric patients from Suraksha Hospital's nephrology departments were included in the study. Specifically created predesigned pro forma were used to collect the data. The prescription sheet for the patient was

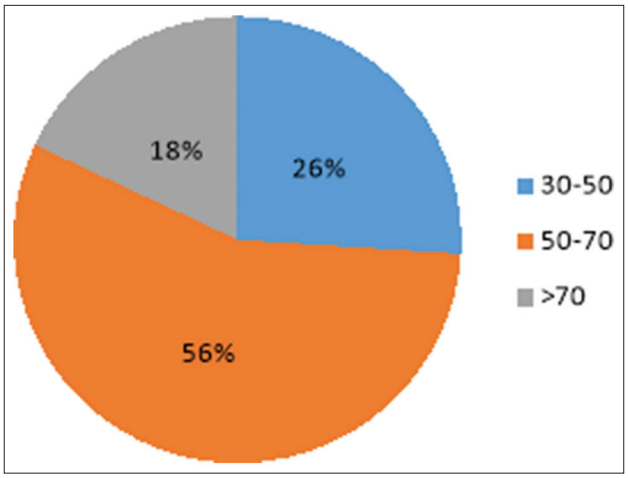

Figure 4: Examination of the population's age groups

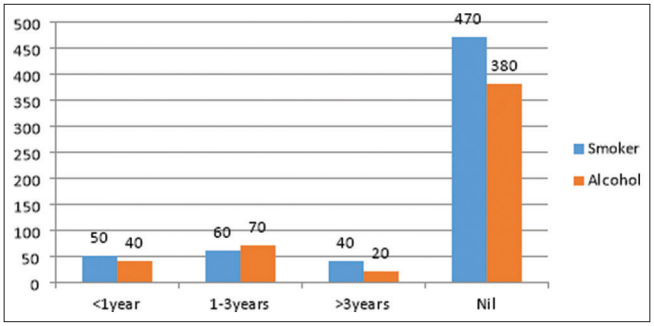

Figure 5: Smoking and drinking patterns in a sample population

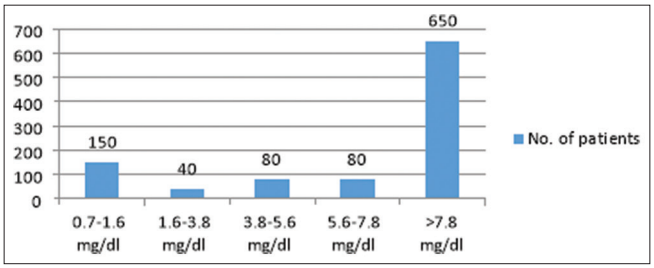

Figure 6: Serum creatinine analysis in a given population

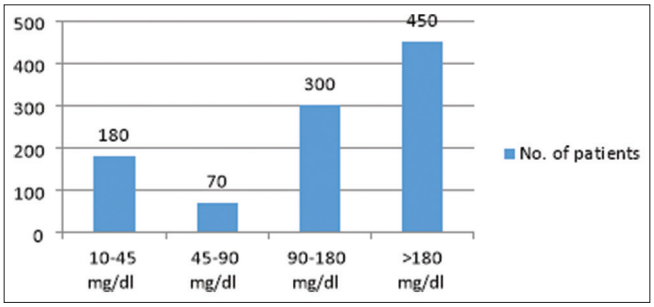

Figure 7: Analysis of blood urea nitrogen in a specific population

assessed, and the distribution of patients by age and gender, the diseases they had, their smoking, drinking, and prescribed medications was all looked at [Figure 5 and Table 5].

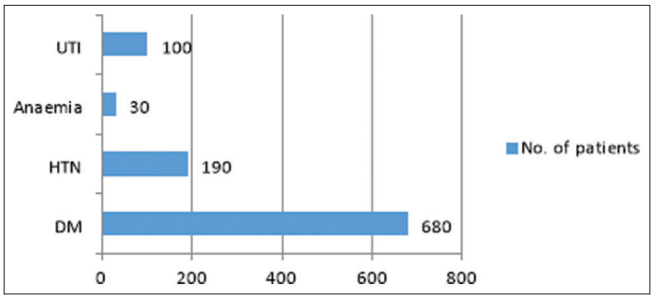

Figure 8: Analysis of various diseases in a specific population

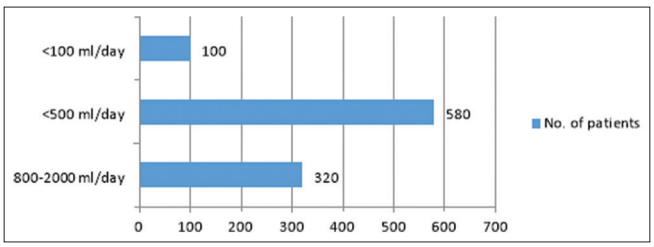

Figure 9: Examination of urine production in a given population

Microsoft Excel was used for the analysis. Using SPSS 16, the findings and conclusions will be generated.

Inclusion criteria: study criteria [Figure 3 and Table 3]

Age above 30 years old; availability of a trustworthy informant; patient or attendant provided as informant; both sexes included in the study;

Exclusion standards:

The following criteria were excluded from the study:

- Those who won't supply the facts
- Pediatrics should not be taken into consideration.

Tools

1. Sociodemographic profile: Patients were given the sociodemographic and clinical profile sheet to collect information about their age, sex, education level, work position, type of family, location, and cause
2. Previous drug history
3. Excel for Windows.

RESULTS AND DISCUSSION

The above retrospective study of kidney function infection in evaluating various disease stage conditions in various age groups and gender populations shows Our investigation delved into the effects of various diseases, with a particular focus on individuals aged 50 to 70 years. Notably, males within this age range exhibited a higher likelihood of impaired kidney function. Diabetes Mellitus (DM) emerged as the

primary contributor to kidney impairment in the general population. Additionally, there were other conditions, such as anaemia, hypertension, and urinary tract infections, which had a marginal impact on kidney function.

Our projections indicated that individuals with a history of 1–3 years of smoking were likely to experience kidney damage due to inhaling tobacco smoke. In the study population, serum creatinine values exceeding 7.8 mg/dL were observed, serving as an indicator of the severity of renal injury. Elevated serum creatinine levels were associated with more significant renal damage.

Furthermore, we identified blood urea nitrogen as a more dependable diagnostic tool for kidney impairment compared to other biomarkers, particularly when the levels exceeded 180 mg/dL. Another severe sign of kidney damage was observed in decreased urine output, defined as a fall of <500 mL/day. Importantly, our findings suggested that transitioning from single-drug therapy to combination-drug therapy was associated with a reduced risk of kidney damage.

DISCUSSION

The study was an effort to determine the risk of kidney damage brought on by illnesses. 1000 cases were brought to the Suraksha Hospital. 600 men (or 60%) and 400 women (or 40%) made up the 1000 cases. Patients between the ages of 50 and 70 make up 560 of the patients with kidney damage (56%), while those between the ages of 30 and 50 make up 260 of the patients (26%), and those over the age of 70 make up 180 of the patients (18%). According to the aforementioned data, those 50–70 years old (56%) and those above 70 years old (18%) were most affected. Fifty patients (5%) had smoked within the previous year. Sixty patients (6%) had 1–3 years, and 40 patients (4%) had more than 3 years. There were 470 patients (47%) who did not smoke. In 1 year, 50 patients, alcohol use was common (5%) 70 patients (1–3 years, or 7%); 20 patients (2–3 years). There were 380 (38%) non-drinkers. In this study out of 1000 cases, serum creatinine levels are elevated. The ranges are >7.8 mg/dL in 650 patients (65%), 0.7–1.6 mg/dL in 150 patients (15%), 3.8–5.6 mg/dL in 80 patients (80%), and 1.6–3.8 mg/dL in 40 patients (4%). In this study out of 1000 cases, blood urea nitrogen ranges from >180 mg/dL in 450 patients (45%), 90–180 mg/dL in 300 patients (30%), 10–45 mg/dL in 180 patients (18%), and 45–90 mg/dL in 70 patients (7%). Out of 1000 cases in this study, the average urine production ranged from 500 to 2000 mL/day in 580 patients (58%) to 100 mL/day in 100 patients (10%). In this study, out of 1000 patients, the diseases which are responsible for kidney failure are DM patients 680 (68%), hypertension patients are 190 (19%), urinary tract infection 100 (10%), and anemia patients are 30 (3%). In our study, the disease which is responsible for kidney failure is DM and lower percentage is anemia.

CONCLUSIONS

Our investigation has found diseases' effects. The age range of 50 to 70 years was particularly relevant because males were more likely to have impaired kidney function. DM is the condition that most commonly results in kidney impairment in the population as a whole. Other illnesses that just marginally affect kidney function include anemia, hypertension, and urinary tract infections. It was projected that subjects who had smoked for 1–3 years would develop kidney damage by breathing in tobacco smoke. Serum creatinine values more than 7.8 mg/dL were found in the study population. The severity of renal injury is indicated by elevated serum creatinine levels. Blood urea nitrogen is a more reliable diagnostic tool for kidney impairment than other biomarkers, with a range greater than 180 mg/dL. Decreased urine output, which we saw as a fall of <500 mL/day, is a sign of kidney damage that is more severe. The aforementioned data show that switching from single drug therapy to combination drug therapy lowers the risk of kidney damage.

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