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A Study on Evaluation of Renal Drug Dosing Practices, Stages, Treatment Profile and Outcomes in Kidney Disease Patients in a Tertiary Care Hospital

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ABSTRACT
Introduction: Kidney damage refers to pathologic abnormalities suggested by imaging studies or renal biopsy, abnormalities in urinary sediment, or increased urinary albumin excretion rates. The true incidence and prevalence of CKD are challenging to determine due to the asymptomatic nature of early to moderate stages. **Methodology:** The prospective observational study was carried out for a period of 6 months. The study was conducted in Nephrology department in a tertiary care hospital. A written and informed consent was obtained from the recruited patients. A Total of 200 patients were enrolled in the study. **Aim:** The study aimed to assess the renal dosing practices, stages, treatment profile and outcomes in kidney disease patients in a tertiary care hospital. **Results & Discussion:** In our study 36-45 years age patients were 59(29.5%) as compared to other ages. Stages of renal failure includes 5 stage patients were more 66(33%) as compared to other renal failure stages. Clinical manifestations of renal failure Patients Dysuria patients were more 63 (31.5%), as compared to other clinical symptoms. Drug prescribing pattern for renal failure management includes ACE inhibitors prescribed drugs patients were more 56 (28%) as compared to ARB prescribed drugs patients were 52 (26%), Calcitriol prescribed drugs patients were 33 (16.5%), Vitamin D prescribed drugs patients were 25 (12.5%), Atorvastatin prescribed drugs patients were 34 (17%). **Conclusion:** To combat the rising burden of CKD, comprehensive strategies must be implemented, including early detection, management of underlying conditions, lifestyle modifications, and public health interventions to address environmental and genetic factors at the clinical level.
Keywords: Kidney damage, Pathologic abnormalities, Dysuria, ACE inhibitors, Lifestyle modifications, Management.

INTRODUCTION

Chronic kidney disease (CKD) is characterized by the presence of kidney damage or an estimated glomerular filtration rate (eGFR) of less than 60 mL/min/1.73 m², persisting for 3 months or more, irrespective of the cause. CKD is a state of progressive loss of kidney function, ultimately resulting in the need for renal replacement therapy, such as dialysis or transplantation. Kidney damage refers to pathologic abnormalities suggested by imaging studies or renal biopsy, abnormalities in urinary sediment, or increased urinary albumin excretion rates[1-3].

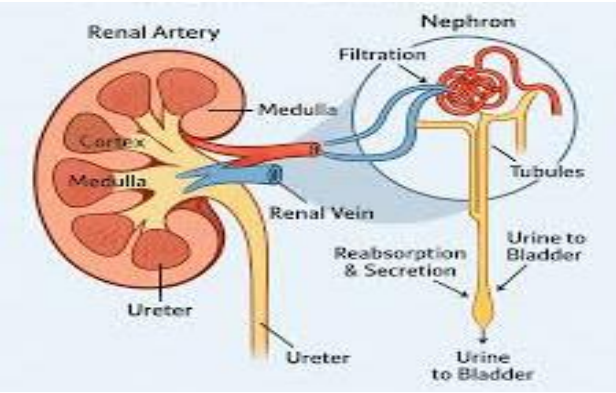

Fig 1: Kidney Functioning

The 2012 Kidney Disease Improving Global Outcomes CKD classification recommends specifying the cause of CKD and classifies the condition into 6 categories based on GFR (G1 to G5, with G3 split into 3a and 3b). In addition, it also includes staging based on 3 levels of albuminuria (A1, A2, and A3), with each stage of CKD subcategorized according to the urinary albumin-creatinine ratio (ACR; mg/g or mg/mmol) in an early morning "spot" urine sample.

The 6 CKD categories, known as stages 1 through 5, are described below (stage 3 is separated into 3a and 3b):

- G1: GFR 90 mL/min/1.73 m^2 and above with evidence of kidney disease, such as hematuria or proteinuria
- G2: GFR 60 to 89 mL/min/1.73 m^2
- G3a: GFR 45 to 59 mL/min/1.73 m^2
- G3b: GFR 30 to 44 mL/min/1.73 m^2
- G4: GFR 15 to 29 mL/min/1.73 m^2
- G5: GFR less than 15 mL/min/1.73 m^2 or treatment by dialysis

The 3 levels of albuminuria include an ACR:

- A1: ACR less than 30 mg/g (<3.4 mg/mmol)
- A2: ACR 30 to 299 mg/g (3.4-34 mg/mmol)
- A3: ACR greater than 300 mg/g (>34 mg/mmol)

Etiology

The causes of CKD vary globally, with the most common primary diseases leading to CKD and, ultimately, end-stage renal disease (ESRD) being[4-9]:

- Type 2 diabetes (30%-50%)
- Type 1 diabetes (3.9%)
- Hypertension (27.2%)
- Primary glomerulonephritis (8.2%)
- Chronic tubulointerstitial nephritis (3.6%)
- Hereditary or cystic diseases (3.1%)
- Secondary glomerulonephritis or vasculitis (2.1%)
- Plasma cell dyscrasias or neoplasm (2.1%)
- Sickle cell nephropathy, which accounts for less than 1% of ESRD patients in the United States.

Epidemiology:

The true incidence and prevalence of CKD are challenging to determine due to the asymptomatic nature of early to moderate stages. The prevalence of CKD in the general population is estimated to be around 10% to 14%. Specifically, albuminuria and an eGFR less than 60 mL/min/1.73 m² have prevalences of about 7% and 4%, respectively.

Risk Factors for Progression of Chronic Kidney Disease

Non-modifiable CKD risk factors:

Older age, male gender, and non-White ethnicity, including Black Americans, Afro-Caribbean individuals, Hispanics, and Asians (South Asians and Pacific Asians), all adversely affect CKD progression. Genetic factors that affect CKD progression have been identified across various kidney diseases.

Modifiable CKD risk factors:

These include systemic hypertension, proteinuria, and metabolic factors. Systemic hypertension is a major cause of ESRD worldwide and the second leading cause in the United States, following diabetes. The transmission of systemic hypertension into glomerular capillary beds and the resulting glomerular hypertension is believed to contribute to the progression of glomerulosclerosis[10-11]. Multiple studies have demonstrated that significant proteinuria (albuminuria A3) is linked to a faster rate of CKD progression in both diabetic and nondiabetic kidney diseases. Reducing significant proteinuria through RAS blockade or dietary modifications is associated with better renal outcomes. However, large intervention studies, such as the Avoiding Cardiovascular Events through Combination Therapy in Patients Living with Systolic Hypertension and the Ongoing Telmisartan Alone and in Combination with Ramipril Global End Point Trial (ONTARGET), observed notable declines in GFR despite substantial reductions in albuminuria. Therefore, moderate-level albuminuria (A2) is not a reliable surrogate marker for CKD progression. Multiple studies have linked the RAAS system to the development of hypertension, proteinuria, and renal fibrosis throughout CKD. Consequently, interventions targeting the RAAS have been effective in slowing CKD progression, leading to the widespread use of RAAS blockers in managing proteinuric and diabetic kidney diseases. Obesity and smoking have been associated with the development and progression of CKD. Additionally, metabolic factors such as insulin resistance, dyslipidemia, and hyperuricemia have also been implicated in CKD development and progression.

Pathophysiology

Unlike acute kidney injury (AKI), which often results in complete functional recovery, chronic and sustained insults from progressive nephropathies lead to ongoing kidney fibrosis and destruction of normal kidney architecture. This process affects all three compartments of the kidney: the glomeruli, tubules and interstitium, and vessels. Histologically, it manifests as glomerulosclerosis, tubulointerstitial fibrosis, and vascular sclerosis[12-16].

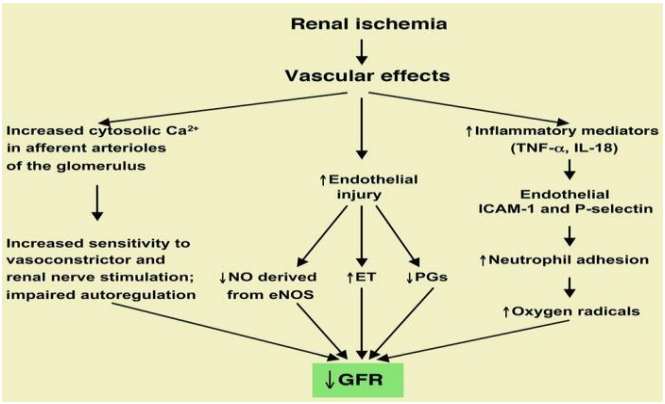

Fig 2: Pathogenesis of ischemic ARF

Common Signs & Symptoms:

Fluid & Swelling: Edema (swelling in legs, ankles, feet, face, hands) due to fluid retention, shortness of breath from fluid in lungs.

Urination Changes:

Decreased urine output, nocturia (nighttime urination), or, less commonly, excessive urination.

Fatigue & Weakness: General tiredness and weakness from anemia (low red blood cell production) and toxin buildup.

Gastrointestinal Issues: Nausea, vomiting, loss of appetite, metallic taste in mouth, and bad breath.

Skin & Neurological:

Dry, itchy skin; muscle cramps; numbness or tingling in hands/feet; confusion; difficulty concentrating; persistent hiccups.

Blood-Related: Easy bruising, nosebleeds, blood in urine (hematuria).

Cardiovascular: High blood pressure (hypertension) and chest discomfort (if fluid surrounds the heart)

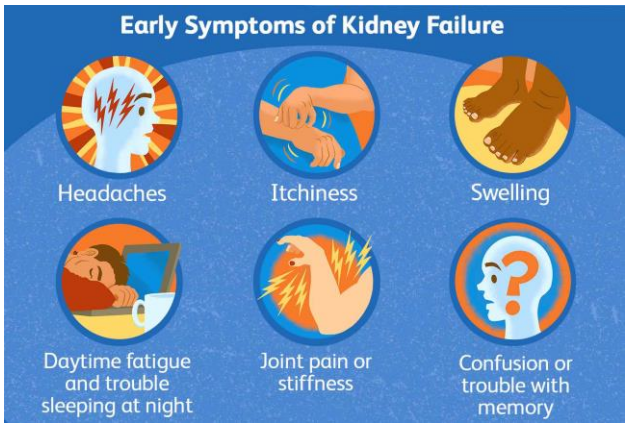

Fig 3: Clinical symptoms of renal failure

METHODOLOGY

The prospective observational study was carried out for a period of 6 months. The study was conducted in Nephrology department in a tertiary care hospital. A written and informed consent was obtained from the recruited patients. A Total of 200 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 Nephrology department in a tertiary care hospital.

Sample size: It was 200 Patients.

Inclusion criteria

- Patients with age of more than 18 years.
- Patients who are willing to give consent.
- Patients receiving treatment for renal failure.
- Recently diagnosed with renal failure.

Exclusion criteria

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

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 selected department of a tertiary care hospital.

Patient data collection and management:

The data collection form contains information regarding age, sex, diagnosis, past medical history, medication history, laboratory data, and diagnosis, 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.

RESULTS

Table 1: Age wise distribution

Age	Total (N=200)	Percentage (%)
21-25	46	23
26-35	55	27.5
36-45	59	29.5
46-55	40	20
Total	**200**	

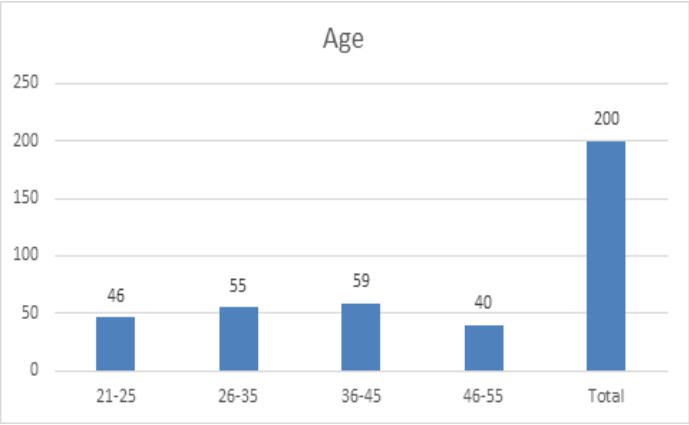

Fig 1: Age wise distribution

Table 2: Gender

Gender	Total (N=200)	Percentage (%)
Male	128	64
Female	72	36
Total	**200**	

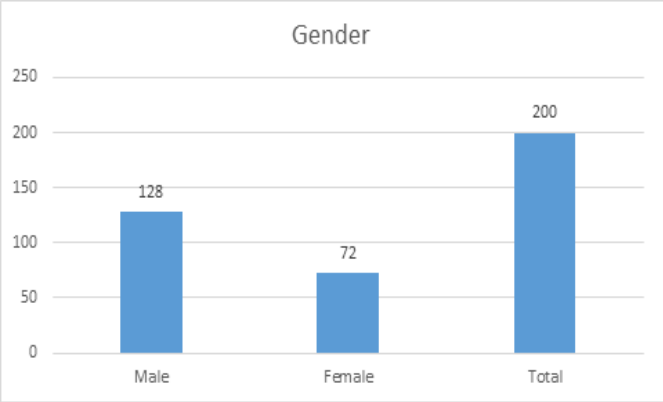

Figure 2: Gender

Table 3: Residential status

Residential status	Total (N=200)	Percentage (%)
Rural	147	73.5
Urban	53	26.5
Total	**200**	

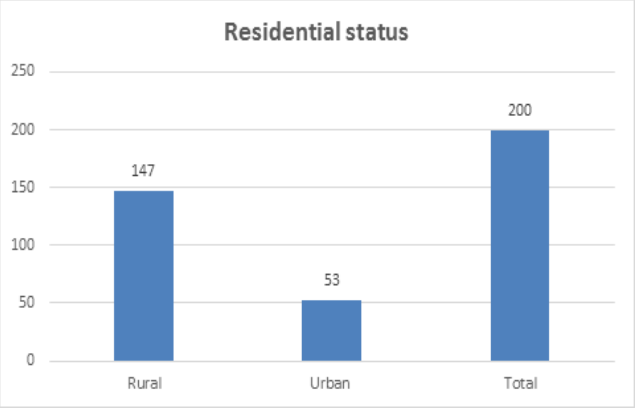

Figure 3: Residential status

Table 4: Education

Education	Total (N=200)	Percentage (%)
SSC	49	24.5
Diploma	85	42.5
Degree	66	33
Total	**200**	

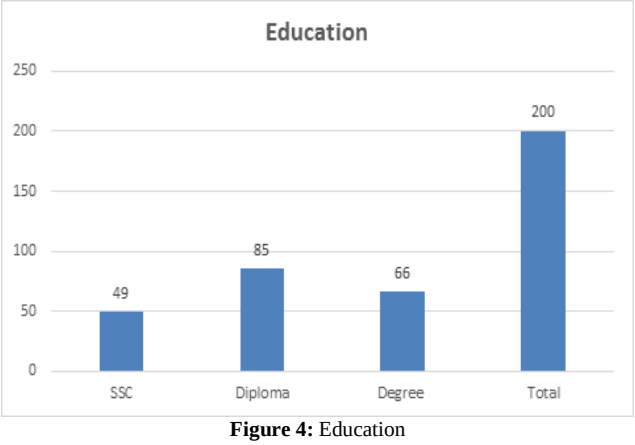

Figure 4: Education

Table 5: Socioeconomic status

Socioeconomic status	Total (N=200)	Percentage (%)
Low	78	39
High	64	32
Middle	58	29
Total	**200**	

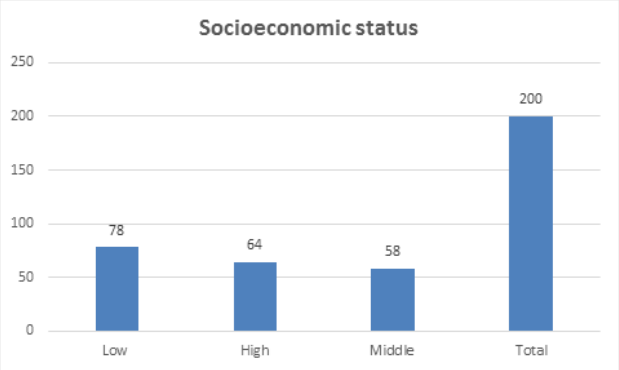

Figure 5: Socioeconomic status

Table 6: Stages of renal failure

Stages of renal failure	Total (N=200)	Percentage (%)
1 stage	56	28
3 stage	44	22
4 stage	34	17
5 stage	66	33
Total	**200**	

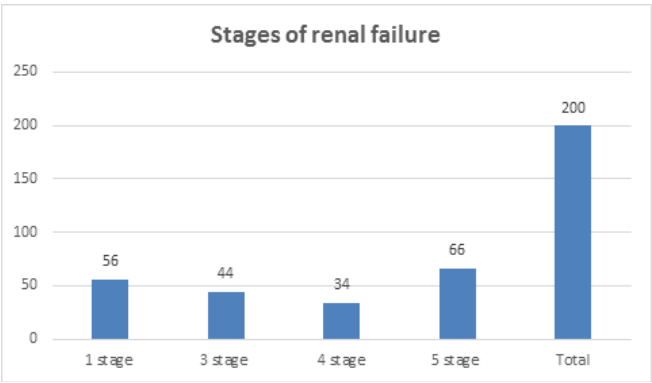

Figure 6: Stages of renal failure

Figure 7: Occupation

Table 7: Occupation

Risk factors	Total (N=200)	Percentage (%)
Farmer	56	28
Driver	65	32.5
Employee	79	39.5
Total	**200**	

Table 8: No of days admission

Hospital admission	Total (N=200)	Percentage (%)
1--2 days	57	28.5
3--5 days	74	37
6--7 days	69	34.5
Total	**200**	

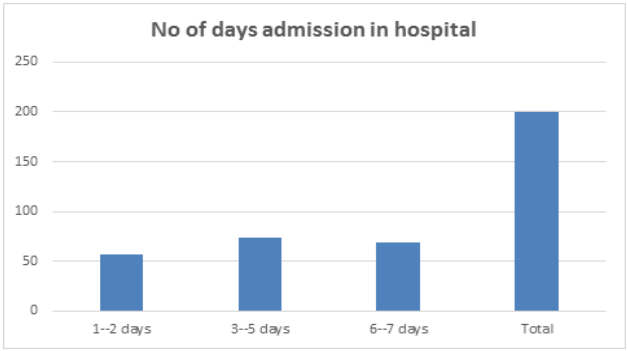

Figure 8: No of days admission in hospital

Table 9: Clinical manifestations of renal failure Patients

Clinical manifestations	Total (N=200)	Percentage (%)
Dysuria	63	31.5
Pedal edema	44	22
Decrease urine output	43	21.5
Breathlessness	29	14.5
Cough	21	10.5
Total	**200**	

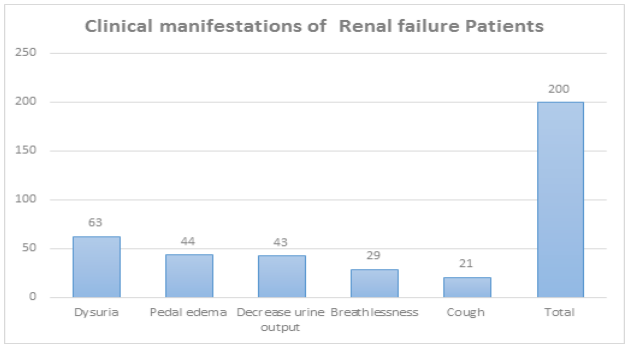

Figure 9: Clinical manifestations of renal failure Patients

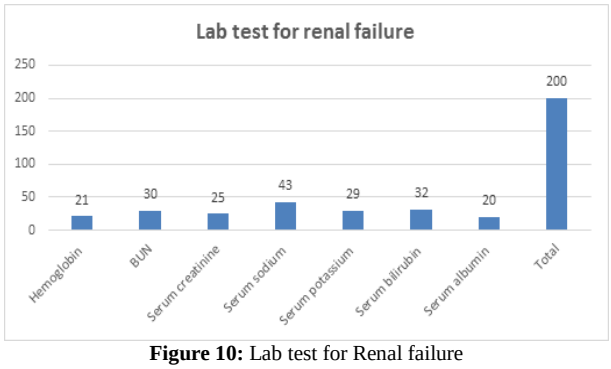

Figure 10: Lab test for Renal failure

Table 10: Lab test for renal failure

Prescribed drugs	Total (N=200)	Percentage (%)
Hemoglobin	21	10.5
BUN	30	15
Serum creatinine	25	12.5
Serum sodium	43	21.5
Serum potassium	29	14.5
Serum bilirubin	32	16
Serum albumin	20	10
Total	**200**	

DISCUSSION

1. In our study 36-45 years age patients were 59(29.5%) as compared to other ages.
2. In our study male patients were more 128(64 %) as compared to female patients were 72 (36 %).
3. In our study rural area patients were more 147 (73.5 %), as compared to urban area patients were 53 (26.5 %).
4. In our study Diploma education patients were more 85 (42.5%) as compared to other education qualification.
5. Socioeconomic status includes low income patients were more 78 (39 %), as compared to other socioeconomic status of patients.
6. Stages of renal failure includes 5 stage patients were more 66(33%) as compared to other renal failure stages.
7. Occupation wise distribution includes patients were 79(39.5%) as compared to others.
8. No of days admission in hospital includes 3-5 days hospital admitted patients were more 74 (37 %) as compared to others.[106-110]
9. Comorbidities includes Diabetes mellitus patients were more 59(29.5%) as compared to others.
10. Clinical manifestations of renal failure Patients Dysuria patients were more 63 (31.5%), as compared to other clinical symptoms.
11. Serum sodium lab test patients were more 43(21.5%) as compared to other lab test.
12. Type of renal failure includes Pre renal patients were more 97 (48.5%) as compared to other renal failure types.
13. Outcomes of renal failure treatment includes Death patients were more 85 (42.5%) as compared to other treatment outcomes[23-24].
14. Treatment plan for renal failure includes dialysis treatment patients were more 117 (8.5%), as compared to medications prescribed patients were 83 (41.5%).
15. Drug prescribing pattern for renal failure management includes ACE inhibitors prescribed drugs patients were more 56 (28%) as compared to ARB prescribed drugs patients were 52 (26%), Calcitriol prescribed drugs patients were 33 (16.5%), Vitamin D prescribed drugs patients were 25 (12.5%), Atorvastatin prescribed drugs patients were 34 (17%)[25].

CONCLUSION

The study concludes that Health care team should focus on the prevention strategies for the most common contributors to renal failure development, mortality, complications, and to decrease the health care burden among the patients. Chronic Kidney Disease is a multifaceted condition with a diverse clinical profile and targeted with numerous underlying etiologies. The incidence of CKD is a major health hazard in our country. The present study aims to spotlight the growing incidence of CKD among the population. The major symptoms were anorexia, Oliguria, dyspnea the major signs were pedal edema, pallor and pleural effusion were noted among the patients[26]. The chief etiological factors of the disease are diabetes mellitus, hypertension and analgesic nephropathy. Insidious onset and asymptomatic progression dictate that renal complication of these diseases is detected late in the natural history of the diseases, thus increasing disability premature mortality, and considerable financial burden on families and society. The authors recommend that the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular disease and Stroke should consider including CKD in its domain.

To combat the rising burden of CKD, comprehensive strategies must be implemented, including early detection, management of underlying conditions, lifestyle modifications, and public health interventions to address environmental and genetic factors. Furthermore, ongoing research is essential to better understand the specific regional determinants of CKD and tailor prevention and treatment approaches accordingly. By implementing targeted interventions, renal failure screening protocols, promoting medication safety, enhancing patient education, and supporting collaborative care models, health-care systems can improve patient outcomes and reduce the incidence of future occurrence of drug-induced AKI.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

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AI TOOL DECLARATION

The authors declare that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

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