

Prevalence, Risk Factors, and Prescribing Trends in Chronic Renal Failure in the Indian Population

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Abstract

Objective: To estimate the prevalence of Chronic renal failure (CRF) in the Indian subcontinent and to identify risk factors and treatment regimens for CRF. **Methods:** A prospective observational study was carried out for 7 months. A total of 200 patients with a level of creatinine >1.5 mg/dl were enrolled. CRF prevalence was measured using the hospital's inpatient department registry and medical records. The risk factors and prescribing were evaluated from the patient file report. **Results:** The prevalence rate of CRF was 13.7%. Male patients (59%) dominate the entire group of patients. Most patients (n = 52) were found between the age group of 71–80 years with a mean age of 62.67 ± 16.33 years. Drugs such as diuretics, and hypoglycemics were indicated to treat comorbidities. The average number of drugs per prescription were 7.43 ± 2.75 with high use of antimicrobial agents (88%). Out of 156 drugs prescribed, 76 were from essential as per essential Drug List 2017. Hypertension ($P = 0.0072$) and diabetes ($P = 0.0084$) were major concerns as risk factors followed by the drugs used for dyslipidemia, and recurrent infections. **Conclusion:** The prevalence rate was found to be 13.7% with significant association with risk factors such as hypertension, diabetes, and nonsteroidal anti-inflammatory drugs, dyslipidemia, chronic infections, smoking, and renal calculus for CRF. The pattern of prescribing was suitable and with few irrationalities.

Keywords: Chronic renal failure, prescribing trends, prevalence, risk factors

INTRODUCTION

Chronic renal failure (CRF) is a dynamic deterioration in renal function with nephronic loss and sclerosis over months or long periods. A crucial problem in therapeutic administration and the economy may be the expanding case of CRF. In India, Visakhapatnam, trailed by Kanpur and Delhi, has seen the most notable events.^[1,2]

In India, the prevalence rate is 13.10% in stages 1–5 and 6.76% in stages 3–5. Risk variables affect the ailment strategy, which joins vulnerability, initiation, and progression variables. CRF has modifiable components such as cardiovascular illness, diabetes, dyslipidemia, repetitive infections, smoking, and drugs utilized, whereas nonmodifiable risk components are male gender, age, and family history.^[3]

The number of drugs suggested to CRF patients is one of the foremost raised among other illnesses. It communicates that a

reasonable choice of the pharmaceutical and appropriate doses reduces the event of nephrotoxicity and superior clinical comes about being seen. Variety in treatment and absence of any data for established dosing incited consider on the endorsing design in patients with CRF and to examine the endorsing designs in this population. They depend on the reality of the illness different dose forms of antimicrobial are utilized. The combinations of antimicrobial drugs are prompted in patients who are suspected of numerous diseases and in patients not responding to a single antimicrobial.^[4-6]

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How to cite this article: Suthar J, Patel RD, Desai S. Prevalence, risk factors, and prescribing trends in chronic renal failure in the Indian population. *J Pharmacol Pharmacother* 2021;12:86-90.

Received: 12-10-2020

Revised: 28-01-2021

Accepted: 17-03-2021

Web Publication: 17-09-2021

Access this article online

Quick Response Code:



Website:
www.jpharmacol.com

DOI:
[10.4103/jpp.JPP_149_20](https://doi.org/10.4103/jpp.JPP_149_20)

There are few epidemiological researches with clear reference to CRF, and few researches have covered the prescription trend in chronic kidney disease (CKD). On the other hand, drug prescribing studies have indicated that there are less risk factors associated with CRF in India. Therefore, the present study was intended to determine the risk factors and their association with CRF and drug use patterns in CRF.

METHODS

A Prospective Observational study for 7 months duration (July 2018 to January 2019) was carried out at a tertiary care hospital Jivraj Mehta Smarak and Health Foundation, Ahmedabad over 7 months. The study protocol was approved by the Dr. Jivraj Mehta Smarak Health Foundation, Bakeri medical Research Centre Institutional Ethics Committee (IEC Reg. No: ECR/274/Inst/GJ/2013/RR-16).

Data collection procedure

During the study period, 200 patients were enrolled for CRF from the Inpatient Department of Jivraj Mehta Smarak and Health Foundation, Ahmedabad.

First, details about the study were explained to the patients, and informed consent was obtained. The patient's demographic details, laboratory parameters, and treatment data were collected and recorded in case record form [Figure 1].

Study criteria

Patients with the following study criteria were included. Patients who were suffering from CRF having a history of more than 1 year and creatinine >1.5 mg/dl and willing to participate in the study after informed consent were enrolled. Patients of both genders and ages >18 were included. Patients having risk factors were identified and recorded in the CRF. Patients of kidney transplants were excluded.

Statistical analysis

The baseline data presented as mean $\pm$ standard deviation and the Fisher's exact test was used to correlate risk factors and CRF. $P < 0.05$ was considered statistically significant for all tests. Statistical analyses were performed using software Graphpad Prism Ver 6 for Windows (San Diego, California, USA).

RESULTS

A total of 1457 patients were hospitalized during the period of the study, out of which 200 (13.7%) had CRF. The mean age was 62.67 ± 16.33 , and 59% (118/200) of the patients were male, and 41% of patients were female. A total of 71% of patients were in the age group of 51–80 years [Figure 2]. The average duration of CRF in patients was 2 years (22.4 ± 15 months). A total of 110 patients were advised for dialysis. The average of creatinine was 5.38 ± 3.17 mg/dl before dialysis, and 4.00 ± 2.43 mg/dl was after the first dialysis. According to DaVita kidney care^[7], the stages of CRF were categorized into 1–5 depending on the estimate glomerular filtration rate [Figure 3]. The number of

patients in early-stage CRF were stage 1 (2%), stage 2 (4.5%), stage 3 (18%) and patients on later stages of CRF were stage 4 (26.5%), stage 5 (49%). A nonparametric Spearman correlation between creatinine and CRF was found, and it showed a weak positive correlation ($r = 0.1334$ and $P = 0.0164$) [Table 1].

After reviewing the patient files at the hospital, it was observed that the major co-morbidities in CRF patients were hypertension, diabetes, dyslipidemia, anemia [Table 2]. In contrast, recurrent infections, kidney disease, thyroid dysfunction were present in a few patients. Hypertension (111 [55.5%]) was the most common comorbidity followed by diabetes mellitus (102 [51%]). Table 3 shows the risk factors of CRF according to age. Hypertension (33.5%) and diabetes

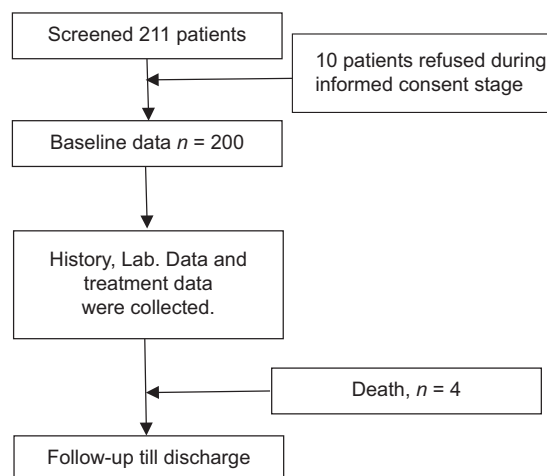


Figure 1: Patient recruitment process

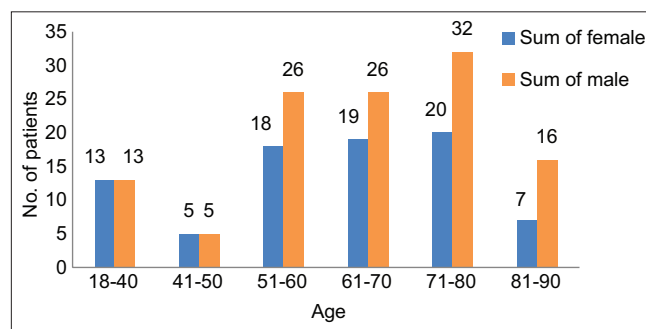


Figure 2: Demographic details (age groups)

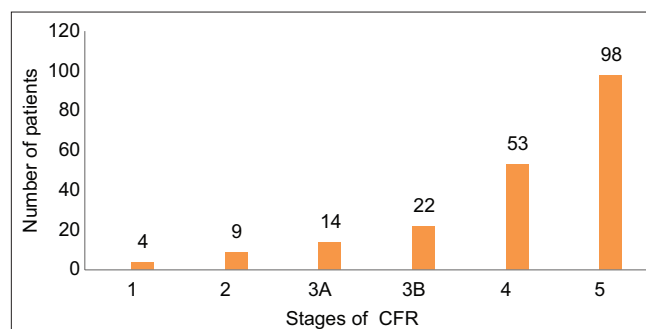


Figure 3: Stages of chronic renal failure

mellitus (30.8%) were the most common causes of CRF, followed by dyslipidemia (11.5%). Hypertension ($P=0.0072$) and diabetes (0.0084) showed significant correlation [Table 3].

The treatment regimen for CRF included diuretics, dietary supplements, nutrition, and bone marrow stimulants. Drugs prescribed to CRF patients were 156, including antacids (88%), antimicrobials (77%), and antihypertensive (55.5%), diuretics (44.5%) [Table 4]. The prescription for Vitamin D, sodium bicarbonate and calcium supplements were also high. The most common prescribed antimicrobials were cephalosporins (ceftriaxone and cefoperazone) and fluoroquinolones (ciprofloxacin and levofloxacin). More than one antibiotic was prescribed in 46 patients. The most prescribed dosage form was tablets 781 (52%) and injections 696 (46%). Patients suffering from CRF received at least 5 to 19 drugs per prescription. The average number of drugs per prescription was 7.43 ± 2.8 . The details of the prescription of indoor CRF patients were expressed in number as per the WHO indicator [Table 5].^[8] In 200 patients, the frequency of drugs was 1486, and the total number of drugs without repetition was 156 of which 76 drugs are in the essential drug list.^[9]

Table 1: Lab parameters

Lab parameters	Before	After	Paired <i>t</i> -test (<i>P</i>)
Creatinine (<i>n</i> =110) (mg/dl)	5.38±3.17	4.00±2.43	0.0164
BUN (<i>n</i> =58)	50.22±32.60	53.17±38.69	0.7518
Urea (<i>n</i> =58)	102.42±56.87	117.31±80.73	0.3706
Hemoglobin (<i>n</i> =161)	9.94±2.36	9.95±1.74	0.9709

*The $P<0.05$ significant using paired *t*-test. BUN=Blood Urea Nitrogen

Table 2: Associated co-morbidities

Associated co-morbidities	<i>n</i> =200, <i>n</i> (%)
Hypertension	111 (55.5)
Diabetes mellitus	102 (51)
Hypertension + ischemic heart disease + coronary artery disease	47 (23.5)
Dyslipidemia	34 (17)
Anaemia	24 (12)
Other	25 (12.5)

Table 3: Risk factors of chronic renal failure

Risk factors	Total (<i>n</i> =331), <i>n</i> (%)	<40 years (<i>n</i> =29), <i>n</i> (%)	40-60 years (<i>n</i> =74), <i>n</i> (%)	>60 years (<i>n</i> =228), <i>n</i> (%)	<i>P</i>
History of hypertension	111 (33.5)	10 (34.4)	27 (36.5)	74 (32.4)	0.0072
History of diabetes mellitus	102 (30.8)	8 (27.6)	23 (31.0)	71 (31.1)	0.0084
Drug (NSAIDs)	38 (11.5)	4 (13.8)	11 (14.9)	23 (10.0)	0.0744
History of dyslipidaemia	34 (10.2)	1 (3.4)	4 (5.4)	29 (12.7)	0.0839
Smoking	21 (6.3)	4 (13.8)	5 (6.8)	12 (5.3)	0.1069
Recurrent infections	15 (4.5)	0	3 (4.0)	12 (5.3)	0.1325
Kidney disease	6 (1.8)	2 (6.9)	0	4 (1.8)	0.1569
History of renal calculi	4 (1.2)	0	1 (1.3)	3 (1.3)	0.1719

*The $P<0.05$ significant using Chi-square (Fisher's exact test). NSAIDs=Nonsteroidal anti-inflammatory drugs

DISCUSSION

A handful of information on the drug prescribing trends and risk factors associated with CRF is available in India. A total of 200 patients were enrolled, and the prevalence rate was found to be 13.7% irrespective of disease condition during the period of the study. The prevalence rate was found to be similar in other regions of India.^[3] Out of 200 patients, 118 (59%) population was male gender. The mean age was found to be 62.67 ± 16.33 years, and most patients were in group 51–80 years (70.5%). All patients had CRF for more than around 2 years (22.4 ± 15 months). A study by Malekmakan *et al.* showed that the mean age was 54.1 ± 16.7 years and 58.6% (371/633) of males.^[10]

The patients had hypertension (32%) and diabetes mellitus (30%) followed by dyslipidemia (10%) as comorbid conditions. A study by Manley *et al.* reported that regardless of age, patients had hypertension, diabetes, and anemia as the most common comorbidities.^[11] An increase in the duration of comorbidities leads to deterioration of kidneys. Most of the patients were in Stage V (49%), according to the classification done by DaVita kidney care.^[7] Mortality was also reported in four patients (2%). Coresh *et al.* study revealed that most patients belonged to Stage III CRF; however, these patients were first diagnosed in an advanced stage of CRF.^[12] Probably, the lack of awareness regarding kidney disease among patients and ignorance may lead to delays in diagnosis; most patients were identified in the later stages of CKD. In the present study, patients were referred to a hospital in the advanced stages, so this may be the reason for a larger number of patients in stage V.

Cephalosporins (25%) and fluoroquinolones (22%) were the most prescribed antibiotics with appropriate doses for renal failure. A total of 76 patients had received antimicrobial fixed-dose combinations, wherein monotherapy showed an inadequate response. The study by Santra *et al.* highlighted that CRF patients are more prone to recurrent infections and have decreased or absence of excretion by kidneys.^[13] Hypertensive drugs (55.5%) such as ACE inhibitors, calcium channel blockers, and diuretics were commonly prescribed in patients. A study by Ishida *et al.* reported that CCBs (66.8%) and ARBs (59.9%) were commonly prescribed antihypertensives.^[14]

Table 4: Drugs prescribed in chronic renal failure (n=200)

Drug class (most prescribed sub-class)	Number of patients, n (%)
Anti-ulcer drugs (proton pump inhibitors)	176 (88)
Antimicrobial agents (cephalosporins)	154 (77)
Antihypertensive agents (CCB, ARB's)	111 (55.5)
Hypoglycemic agents (sulfonylureas)	102 (51)
Diuretics (loop diuretics)	89 (44.5)
Antiasthmatic	67 (33.5)
Antihyperlipidemic (statins)	41 (20.5)
Antianginal	37 (18.5)
Antiallergic	32 (16)
Laxative	30 (15)
Analgesic	29 (14.5)
Nutrition	28 (14)

CCB=Calcium channel blocker, ARB's=Angiotensin receptor blocker's

Table 5: WHO prescribing indicator

Core indicators	Value	Percentage
Total number of drugs prescribed	156	-
Average drugs prescribed per prescription	7.43±2.75	-
Medicines prescribed by generic name	5	8.77
Encounters with an antimicrobial agent prescribed	154	77
Encounters with an injection prescribed	196	98
Drugs listed in EDL-2017	76	48.71

EDL=Essential drug list

Prescribing of antihypertensives is appropriate as per the indication. Insulin and sulfonylureas were the choices of the drug in diabetes patients in the present study. Similarly, a study by Trifiro *et al.* mentioned that the most common combinations used were sulfonylurea and biguanide.^[15]

In the current study, 24 (12%) patients had anemia and erythropoietin, and iron supplements were given. Similarly, Gardiner *et al.* reported the administration of iron before erythropoietin-stimulating agents.^[16] Moreover, calcium and vitamin supplements were indicated in patients having extreme age and menopause in a female. Nutrition (27%), electrolytes (21%), diuretics (18%), and bone marrow stimulants were used in addition to diuretics such as furosemide, torsemide, and metolazone were used to decrease the fluid build-up in the body. Electrolytes like sodium bicarbonate were used to maintain the hemostasis of different electrolytes.

In this study, tablets (52%) and injection (46%) dosage forms were used to treat CRF. Wherein, patients received a minimum of 5 to a maximum of 19 drugs per prescription, and the average drugs prescribed per prescription was found to be 7.43 ± 2.75 . However, it is more than 2 as per the WHO guidelines and contributed to polypharmacy. Similarly, another study by Bailie *et al.* reported the average number of drugs as 8 ± 4 per prescription.^[17] Medicines prescribed by generic names were found to be 8.77%, Encounters with an antimicrobial agent prescribed were 77% in the current study. As it is observed that, patients with CRF are prone to infection.^[8] Out of 156,

76 (48.71%) were found to be essential drugs from WHO-EDL 2017.^[18] Similarly, a study by Sapkota *et al.* reported that 41.76% drugs were prescribed from the WHO essential list.^[18]

In the present study, more than half of the patients (55%) were requested for dialysis. Creatinine clearance is one of the investigational parameters of CRF. Our study showed a weak positive correlation between creatinine and CRF ($P = 0.0164$). Risk factors of CRF showed an association in our study. Risk factors such as hypertension ($P = 0.0072$) and diabetes mellitus ($P = 0.0084$) showed a significant correlation in patients with CRF. According to Malekmakan *et al.*, diabetes and hypertension were the leading cause for CRF, and in patients with more than 60 years of age, the most common cause of CRF was found to be diabetes (36.6%).^[10] Frequent use of NSAIDs was the third-most common risk factor for CRF in our study. In the study 11.5% of patients had past history of NSAIDs ($P = 0.0744$) use. A study by Perneger *et al.* showed that a decline in consumption of acetaminophen could decrease the incidence by 8%–10%.^[19] A similar finding was reported by Kazancioğlu. For CRF.^[20]

CONCLUSION

With various ethnic variations in the population, the CRF prevalence rate was found to be 13.7%. There has been a substantial correlation between risk factors such as hypertension and diabetes, although drugs (NSAIDs), dyslipidemia, chronic disorders, obesity, kidney stones, and kidney disease have shown no significant association with the failure. The pattern of prescribing was satisfying, but with little irrationality. As comorbidities and symptomatic effects are associated with it, treating CRF patients is a challenge for a physician. The prognosis of CRF is poor with advanced age and results in mortality. There is a need to identify the health burden associated with CRF, and successful therapies can increase the patient's quality of life.

Acknowledgment

We are thankful to the Dr Jivraj Mehta Smarak Health Foundation team and the participants of the study. The authors would like to thank Hemant Tiwari for statistical data analysis in the preparation of this article.

Conflict of interest

The authors declare no conflict of interest.

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