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A PROSPECTIVE OBSERVATIONAL STUDY TO ASSESS THE PREVALENCE AND IMPACT OF MEDICATION ADHERENCE IN CHRONIC KIDNEY DISEASE PATIENTS WITH OR WITHOUT COMORBIDITIES IN A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

Chronic kidney disease (CKD) is a long standing disease of the kidneys leading to renal failure. Medication adherence is the major factor that determines the therapeutic outcomes in the patient which in turn improves the quality of life. To study the prevalence of CKD related variables and to assess the Medication Adherence using Morisky Medication Adherence Scale (MMAS-8) questionnaire. A prospective observational study was conducted in 180 patients for a period of 6 months in the inpatient general medicine department who were diagnosed with CKD. A total of 180 questionnaires was reviewed and analysed. 180 patients were enrolled in the study, with the prevalence being 61% male and 39% female. Majority of the participants (27.2%) were aged between 51-60 years. Among the total population, 110 patients belonged to stage V, and 79 patients were undergoing haemodialysis. Swelling was the most prevalent symptom observed in patients with CKD. Hypertension, followed by DM, CVD was the most observed comorbidity. According to the MMAS-8 scale, high, moderate, low adherence was reported in 35%, 42%, 22% respectively. Out of the total, 67 patients were classified as adherent population. Gender-wise adherence was seen 24% males and 13% females. Disease adherence and non-adherence was most prominent among CKD patients. In this study, Furosemide was the commonly prescribed medication to 80% of the patients. The prevalence of CKD related variables revealed a

remarkably high incidence of medication non adherence among patients with CKD.

KEYWORDS: *Chronic kidney disease; Prevalence; Morisky medication adherence scale; Comorbidity; Medication adherence.*

INTRODUCTION

Kidneys are bean-shaped paired organs, each weighing about 150g in the adult male and about 135g in female. Kidney is composed of nephrons and it consist of five major parts; the glomerular capsule, the PCT, loop of Henle, DCT and collecting duct. The kidney performs the vital functions in the body like excretion of waste products, regulation of acid-base balance, formation of renin and erythropoietin and thereby plays a role in the BP regulation and erythropoiesis respectively.

Chronic Kidney Disease (CKD) is defined as kidney damage or estimated glomerular filtration rate (eGFR) <60ml/min/1.73m2 for 3 months or more. The normal glomerular filtration is about 125ml/min.[1-2] It is characterized by the gradual replacement of normal kidney structure with fibrotic tissues. When these structural changes become conspicuous, it results in decreased kidneys ability to process waste in the blood and perform other functions.[4]

The increasing prevalence of CKD is due to worldwide incidence of diabetes and hypertension. Globally, CKD represents a major public health issue that can consume substantial financial and social resources. The most common causes of chronic kidney disease includes hypertension, diabetes mellitus, pyelonephritis and certain nephrotoxic drugs such as aminoglycosides, antiretroviral, analgesics, antidepressants etc.

Patients with CKD are present with comorbidities such as diabetes mellitus, hypertension, coronary artery disease and infection. The presence of comorbidities increases the cost of treatment and also a challenge for the treatment of CKD patients. CKD is more common in people aged 65 years or older or 18 to 44 years.

The Kidney Disease Improving Global Outcomes (KDIGO) Organization has summarized stages of CKD based on Glomerular Filtration Rate.

CKD CATEGORY	eGFR(ml/min/1.73m2)	TERM

G1	> 90	Normal
G2	60-89	Mildly decreased
G3a	45-59	Mild to moderately
G3b	30-44	Moderately to severely decreased
G4	15-29	Severely decreased
G5	< 15 (End stage Renal Disease)	Kidney failure

The first step in the treatment is to determine the underlying cause and treating it. ESRD (End Stage Renal Disease) is the final stage of CKD in which the kidneys no longer function well enough to meet the needs of daily life. During this stage, renal replacement therapy is required to stay live, and hemodialysis is considered as the most widely used therapy and plays an essential role in increasing patient's lifetime.[6-9] Types of renal diseases include: CKD, Acute kidney injury(AKI), Polycystic kidney disease, Pyelonephritis, ESRD, Nephrotic syndrome, Hydronephrosis, Renal calculi.

Medication adherence is defined by the World Health Organization as "the degree to which the person's behavior corresponds with the agreed recommendations from a health care provider". Medication adherence usually refers to whether patients take their medications as prescribed, as well as whether they continue to take a prescribed medication.[10]

The Morisky's Medication Adherence Scale (MMAS‑8) questionnaire is a validated diagnostic tool that can be used to assess medication adherence in CKD patients with or without haemodialysis.It comprises of 8 questions with a range of scores from 0 to 8 that are scored on a Likert scale. Treatment adherence is graded as low adherence for MMAS score <6, moderate adherence for MMAS score 6-7 and good adherence with MMAS score as 8.[11]

Patients with CKD are prescribed a regime of multi-pharmacological treatment often starting with antihypertensives and antidiabetics and subsequently phosphate binders, vitamin D preparations, calcium carbonates, erythropoiesis stimulating agents and iron supplements.

This study aims to determine the prevalence and the impact of medication adherence in CKD patients with or without comorbidities.

MATERIALS AND METHODS

Study site: The study was conducted at the General Medicine inpatient department of Chigateri District Hospital Davangere, Karnataka over six months.

Study design: Prospective observational study.

Sample size: The study was conducted in 180 patients at a tertiary care teaching hospital.

Study criteria: The study was carried out by considering the following inclusion and exclusion criteria.

Inclusion criteria

- Inpatients who were diagnosed with CKD and undergoing therapy.
- Patients undergoing haemodialysis.
- Patients above the age of 18 years.
- Patients of either gender.
- Patients who provide consent to participate.
- Patients were included irrespective of the stages of CKD.

Exclusion criteria

- Patients who were admitted in Paediatrics.
- Patients who were pregnant and lactating.
- Patients having missing and insufficient data.
- Patients who were not willing to participate.

Study procedure

A prospective observational study was conducted on inpatients admitted to general medicine departmentof Chigateri District Hospital Davangere over six months. The study received approval from the Institutional Ethical Committee of SCS College of Pharmacy. A specifically designed data collection form was created to gather information, which encompasses, the patient's demographic details, medical history, comorbid conditions, laboratory investigations and medications prescribed for each individual. A MMAS-8 Questionnaire form was used to assess the medication adherence.

RESULTS

A total of 180 patients diagnosed with CKD were scrutinized according to the inclusion and exclusion criteria and interviewed after getting informed consent. The demographic details and medication adherence of each patients were collected in the data collection form and questionnaire for this study purpose.

1. Gender-specific prevalence of ckd patients

Out of these 180 CKD patients, the prevalence was seen highest among the male patients 109 (61%) whereas only 71(39%) were female.

Table 1: Gender-specific prevalence of CKD patients.

Gender	No of patients	Prevalence (%)
Male	109	61%
Female	71	39%

2. Age specific prevalence of ckd patients

Among these patients evaluated, the most prevalent age group was 51-60 years (27.2%) followed by 61-70 years(22.2%), 41-60 years(18.3%), 71-80 years(10%), 21-30 years(8.3%), 31-40 years(7.7%), 81-90 years(4.4%).

Table 2: Age-specific prevalence of CKD patients.

Age	Population	Prevalence (%)
21-30	15	8.3%
31-40	14	7.7%
41-50	33	18.3%
51-60	49	27.2%
61-70	40	22.2%
71-80	18	10%
81-90	8	4.4%
91-100	3	1.6%

3. Stage wise prevalence of ckd patients

Out of all the patients, the prevalence of CKD in the study population according to the stages of CKD as per The Kidney Disease Improving Global Outcomes (KDIGO) Organization has summarized stages of CKD based on Glomerular Filtration Rate; none of the patients belonged to stage I. 110 patients (61%) belonged to stage V, followed by stage IV which had 51 patients (28%), stage IIIb 13 patients (7%), stage IIIa 5 patients (3%). Least number of patients were observed in stage II which had 1 patient (1%).

Table 3: Stage wise prevalence of CKD patients.

Stages	No. of patients	Prevalence
Stage II	1	1%
Stage IIIa	5	3%
Stage IIIb	13	7%
Stage IV	51	28%
Stage V	110	61%

4. Prevalence of symptoms in chronic kidney disease patients

In this study most of the patients were presented with Swelling of arms, legs or face (54%) followed by Breathlessness (38%), Decreased Urine Output (30%), Easy fatiguability (25%), Vomiting(21%), Generalised weakness(16%), Nausea and Pallor (8%), Loss of appetite(7%), Altered sensorium(2%), and Muscle cramp and decreased sleep(1%)

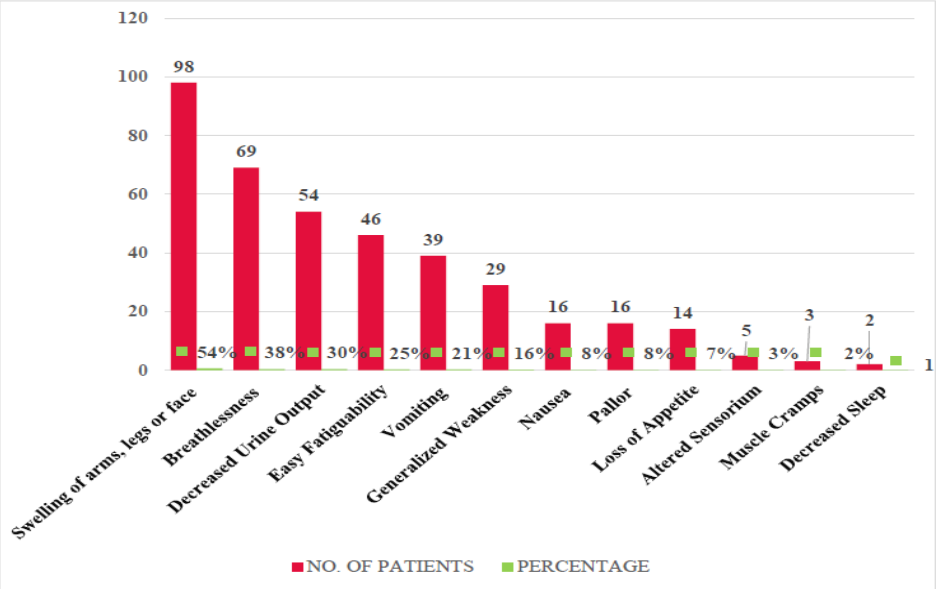

Figure 1: Prevalence of symptoms in chronic kidney disease patients.

5. Distribution of patients on haemodialysis

Out of these 180 patients, this table represents the data from a study that categorised patients based on whether they were undergoing haemodialysis treatment. It was found that 79 patients, representing 43.8% of the total, were receiving haemodialysis. In contrast, a larger group of 101 patients, making up 56% of the population, were not on haemodialysis. This distribution highlights that a majority of the patients in the study were not undergoing haemodialysis treatment.

Table 4: Distribution of patients on haemodialysis.

Haemodialysis	No and % of patients
On Haemodialysis	79(44%)
Not on haemodialysis	101(56%)

6. Prevalence of comorbidities associated with ckd

Among the patients, 120 (66%) had hypertension, making it the most prevalent comorbidity. Diabetes mellitus was present in 72 patients (40%), while cardiovascular diseases affected 42 patients (23.3%). Anaemia was reported in 32 patients (17.7%), and 27 patients (15%) had other comorbidities. Less common conditions included RTI in 21 patients (11.6%), UTI in 18

patients (10%), GI diseases in 16 patients (8.8%), cellulitis and hepatic diseases each in 12 patients (6.6%), acute pulmonary edema in 9 patients (5%), and sepsis in 8 patients (4.4%). Only 4 patients (2.2%) had no comorbidities. This data underscores the high prevalence of multiple comorbid conditions in CKD patients.

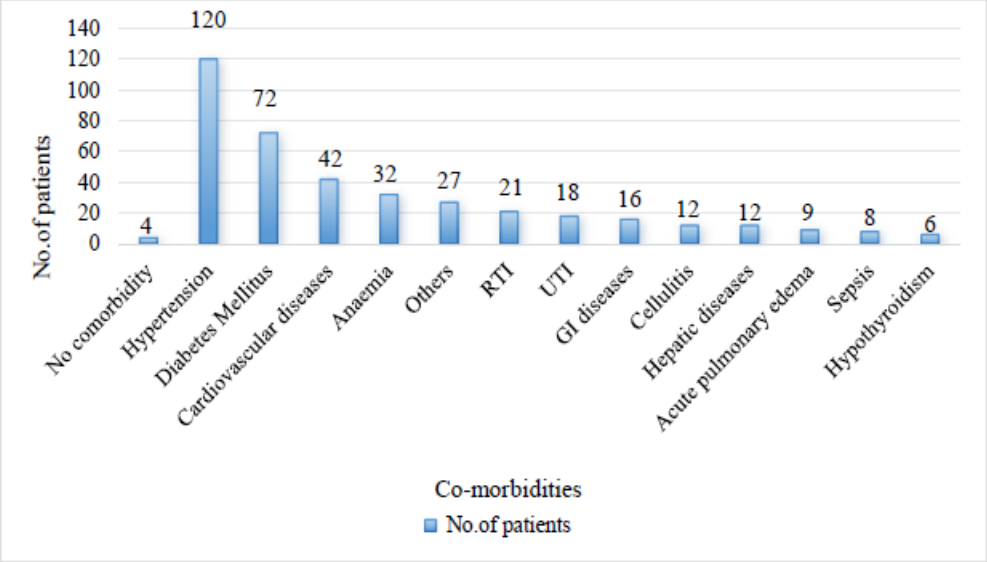

Figure 2: Prevalence of comorbidities associated with CKD.

7. Level of adherence in population through patients response to mmas-8 questionnaire

The table 5(a) represents the results from the study conducted using MMAS-8 questionnaire, which assesses patient's adherence to their CKD medication. Table (a) summarises patient's response to 8 questions related to their medication taking behaviours through which the adherence was defined accordingly as low (score 0-5), moderate (score 6-7) and high (score 8) on the basis of MMAS-8 score [Table 5 (b)]. Our study showed, low level of adherence in 22% of total CKD patients, moderate level of adherence in 42% and high level of adherence in 35%.

Table 5(a): Patients Response To MMAS-8 Questionnaire.

SL.NO	MMAS-8 ADHERENCE QUESTIONS	PATIENT RESPONSE (YES/NO)	
		YES	NO
1.	Do you sometimes forget to take your kidney pills?	31(17%)	149(83%)
2.	People sometimes miss taking their medications for reasons other than forgetting.Thinking over the past 2 weeks,were there any days when you did not take your kidney medicine?	21(12%)	159(88%)
3.	Have you ever cut back or stopped taking your medication without telling your doctor,because you felt worse when you took it?	17(9%)	163(91%)
4.	When you travel or leave home,do you sometimes forget to bring along your kidney medication?	31(17%)	149(83%)
5.	Did you take your kidney medicine yesterday?	152(84%)	28(16%)
6.	When you feel like your kidney disease is under control,do you sometimes stop taking your medicine?	18(10%)	162(90%)
7.	Taking medication every day is a real inconvenience for some people.Do you ever feel hassled about sticking to your kidney treatment plan?	25(14%)	155(86%)
8.	How often do you have difficulty remembering to take all your medications?		
	A. Never/rarely	95(53%)	
	B. Once in a while	62(34%)	
	C. Sometimes	21(12%)	
	D. Usually	2(1%)	
	E. All the time	0	

Table 5 (b): Level of adherence in population.

Level of adherence	No. of patients	Percentage (%)
Low adherence	40	22%
Moderate adherence	76	42%
High adherence	64	36%

8. Adherence wise population

The below table shows that out of the total population, 113 patients were categorized under “non-adherence” while 67 patients fell under adherence”. This shows that a significant portion of the population did not adhere to the treatment being assessed in the study.

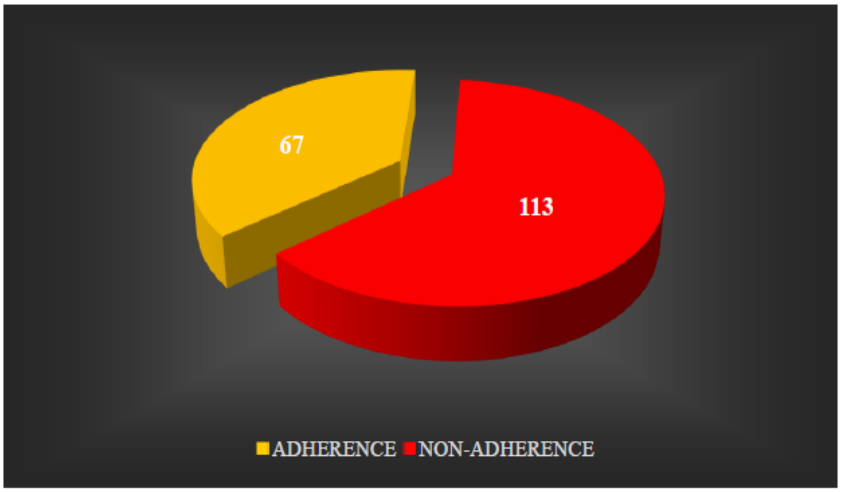

Figure 3: Adherence wise Population.

9. Gender-wise distribution of Adherent and Non adherent population

Out of 180 patients, among males, 42 patients are part of the adherent population, while 67 are non-adherent. For females, 24 are adherent and 47 are non-adherent. This data indicates that in both genders, the non-adherent population is larger than the adherent one, with a more significant difference observed among males.

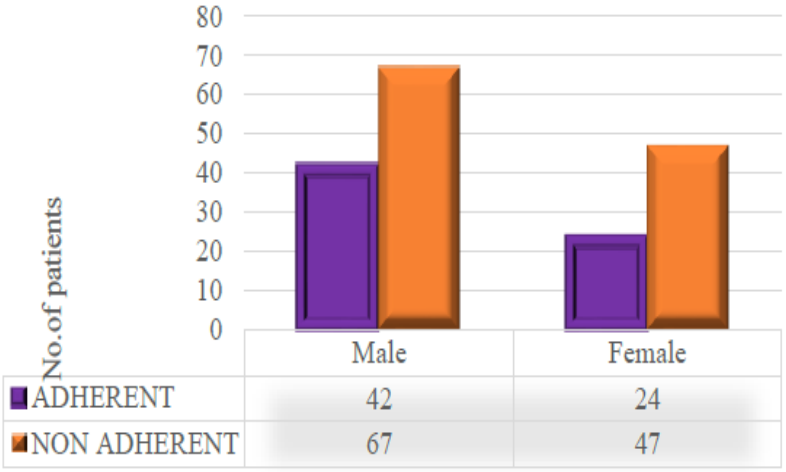

Figure 4: Gender-wise distribution of Adherent and Non adherent population.

10. Disease-Adherence and Non adherence wise population

Among 180 patients across different diseases of CKD, For Chronic Kidney Disease (CKD), 30 patients are adherent, while 62 are non-adherent. Among those with CKD on MHD, 7 are adherent and 12 are non-adherent. For ESRD, 23 patients are adherent compared to 35 non-adherent. Pyelonephritis has 6 adherent and 2 non-adherent patients. Lastly, in ADPKD, 1 patient is adherent and 2 are non-adherent. This data highlights that for most diseases, non-

adherence is more prevalent than adherence, particularly in CKD.

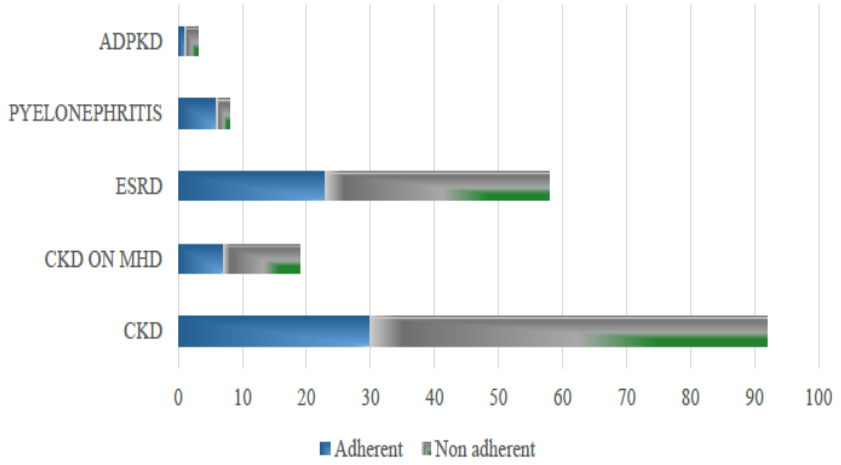

Figure 5: Disease-adherence and non-adherence wise population.

11. List of frequently prescribed medications of ckd

Among the total 180 patients, the table represents the list of frequently prescribed medications of CKD along with the number of patients prescribed each one and the corresponding percentage. Furosemide was the most frequently prescribed, with 145 patients (80.5%) receiving it. Sodium Bicarbonate was prescribed to 107 patients (59.4%), followed by Calcium and Vitamin D3, which was prescribed to 61 patients (33.8%). Clinidipine was given to 54 patients (30%), and Calcium Acetate to 45 patients (25%). Erythropoietin was prescribed to 14 patients, representing 7.7% of the total. This data highlights the common treatments for CKD, with Furosemide being the most prevalent.

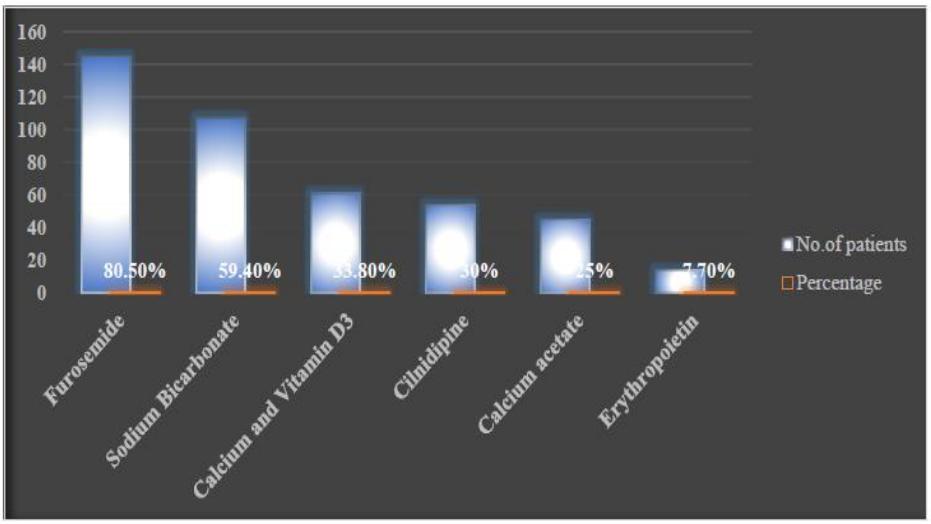

Figure 6: Frequently Prescribed Medications Of CKD.

DISCUSSION

The kidney is a vital organ essential for filtering waste and excess fluids from the blood to form urine. CKD is a long-term condition characterized by the gradual loss of kidney function over time. It is a widespread condition affecting globally in the adult population, with a prevalence increasing significantly with age. The prevalence of CKD also varies by factors such as age, gender and disease stage. Thus medication adherence in CKD patients is crucial for managing the disease effectively, and the layers of comorbidities add layers of complexity to adherence.

A prospective observational study was conducted in 180 patients enrolled for a period of 6 months in the inpatient general medicine department who were diagnosed with CKD. In the present study, the prevalence of CKD based on gender was seen highest among males 61%(109 patients) and females 39%(71 patients). This shows a male predominance over females, which is in occurrence with the results of several other authors such as Verma B et al[2] in Uttarakhand, Bajait C S[15] in Nagpur, Maharashtra etc. This suggests that male are prone to develop CKD when compared to females because of testosterone's pro-apoptotic effects on kidney cells.

Demographic details has shown that the prevalence was seen highest among the age group of 51-60 years 27%(49 patients). This is on par with the studies conducted in Bengaluru, Karnataka by Subeesh V K et al[19] Harshita et al[18] in Haryana as the majority of patients fall within the 51- 60 year age range, because the prevalence of CKD tends to increase with age. Conversely, reduced life expectancy among CKD patients leads to fewer individuals surviving to age 80 and above, resulting in a lower number of patients in this older age group.

In the current study it was found that the prevalence of CKD according to the stages was seen highest among Stage V of 61% (110 patients) this was in concordant to the findings by Shakthirajan R et al[17] in Chennai and Olumuyiwa J F et al[16] in Nigeria. This is due to patients with Stage V CKD often experience more severe symptoms and complications leading to increased healthcare utilization and detection.

According to our study, the most common symptoms in patients from this study population was swelling 54% which is similar to the study conducted in Kalyani Hospital, India by Jha V K et al[20] Among the 180 patients, only 44% was on haemodialysis and 56% were not on dialysis. This is in line with the study conducted by Verma B et al[2] In the current study, we have also evaluated that comorbidities condition with CKD patients. Hypertension was more

prevalent (66%) followed by diabetes(40%),CVD(23.3%), anaemia(17.7%). This agrees to the previous findings done by Olumuyiwa J F et al[16] and by Harshita et al[18] due to the fact that both hypertension and diabetes are the leading causes of CKD globally. These conditions create a complex interplay where each exacerbates the progression of the others, leading to a cycle of worsening renal and cardiovascular health.

The present study results also revealed that out of 180 patients, using the MMAS-8 scale, low adherence was seen in 22%, moderate adherence in 42% and high adherence in 36%. This is in parallel to a study conducted by Verma B et al[2] where low adherence was seen in 26% and medium adherence in 56%. In CKD patients with or without dialysis, it was found that 63% of the patients were non adherent and 37% which is in accordance with the study conducted in Saket, New Delhi by Kaul S.[21] The most often non adherence behaviours were forgetting to take medications, forgetting to take medications while travelling. Particularly, when it comes to take medications for chronic conditions, forgetfulness plays a important role in non adherence. In our study conducted among the 180 patients,37% of male patients were more non- adherent compared to that of females which was similar to a study conducted in Warangal, Telengana by Anoohya J et al.[22] Disease adherence and non adherence (30 and 62 patients) was seen highest in patients with CKD which is in contrast to the study reported by Anoohya J et al[22] where CKD on MHD was observed to be more (13 and 103 patients).This is due to least number of patients on dialysis in our study.

The most commonly prescribed medications in this study was Furosemide(80.5%) which agrees with the previous study conducted by Olumuyiwa J F et al[16] followed by Sodium bicarbonate (59.4%), Calcium and Vitamin D3 (33.8%).

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Author's contribution

All the authors have contributed equally.

Conflict of interest

All authors declare that there are no conflicts of interest.

Ethics declaration

The Institutional Ethics Committee at SCS College of Pharmacy approved the protocol. All residents in the hospital provided informed consent.

Consent for publication

All authors have consented to the publication of their work.

Competing interests

The authors hereby declare that they did not obtain any financial support from any source for the writing, or publication of this article.

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