THE STUDY OF DEMOGRAPHIC CHARACTERISTICS AND CO-MORBID CONDITIONS OF CHRONIC KIDNEY DISEASE PATIENTS IN TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT
Background: Even though there is no cure for chronic kidney disease, the demographic characteristics such as age, gender, education and economic status were significantly associated with the progression of chronic kidney disease. The comorbid conditions can also influence chronic kidney disease patients. Hence awareness needs to be created. **Aim:** To study demographic characteristics and co-morbid conditions among hospitalized chronic kidney disease patient in a tertiary care hospital. **Materials and methods:** A hospital based prospective observational study was conducted for a period of six months with one hundred cases. Data was collected from medical records and interviewing patients. Statistical analysis was performed using SPSS software. **Results:** Out of 100 patients typical age group was 51-60 years with mean age 57.59 ± 13.32. Male patients (59%) more than female patients (41%). Middle class economic status (67%), secondary education level (48%) and moderately active lifestyle (69%) was prevailing. Totally, (38%) alcoholics, (20%) smokers and (6%) tobacco eaters. Stage IV (38%) was highest. Higher comorbidity was Hypertension (30.5%) and Diabetic mellitus type 2 (27.6%). **Conclusion:** This study assessed demographic characteristics and comorbidities associated with CKD patients. More patients were middle aged with maximum males. Middle-class economic patients were further up, reason being less educated and more unhealthy social habits. Males were prime alcoholics and smokers. Top comorbidity was Hypertension and Diabetic mellitus type 2. The stage IV was inflated. Therefore, there is need to investigate social economic factors and comorbidity of patients.

KEYWORDS: Chronic Kidney Disease, Comorbidity, Hypertension, Diabetes mellitus type 2.

INTRODUCTION

The demographic characteristics such as age, gender, education and economic status are significantly associated with the progression of chronic kidney disease (CKD) and if these conditions are untoward, the patients may have a less therapeutic efficacy. Even though there is no cure for CKD, the patients demographic characteristics plays an important role in implementing certain lifestyle changes that aid to slow down the progression of CKD.[1] The other studies had implicated that chronic use of tobacco, smoking and alcohol is associated with CKD.[2,3] Hence additional study is required to explore demographic factors associated with CKD.

According to KDOQI clinical practice guidelines for CKD evaluation, classification and stratification, the criteria for the definition of CKD is gradual loss of kidney function slowly over a long period of time for more than or equal to three months, due to structural or functional abnormalities of the kidney, with or without decreased Glomerular Filtration Rate (GFR), caused by either pathological abnormalities or by markers of kidney damage, including abnormalities in the composition of the blood, urine or in imaging tests and also defined by $GFR<60$ mL/min/$1.73m^2$ for 3 months, with or without kidney damage.[4]

K/DOQI classified stages of CKD based on eGFR as following
Stage 1 - This includes patients with very mild or least kidney damage with normal or decreased eGFR ≥ 90mL/min per 1.73 m^2.
Stage 2 - It consists of patients with kidney damage with

mild decreased eGFR 60–89 mL/min per 1.73 m^2.

Stage 3 - It is further divided into stage 3A and stage 3B. At Stage 3A kidney functions between 45% and 59% and Stage 3B kidney functions between 30% and 44%. It comprised patients with worse kidney damage with moderately decreased eGFR 30–59 mL/min per 1.73m^2.

Stage 4 - This stage involves patient with drastically damaged kidneys. Hence kidneys are incapable to filter waste, toxins and fluids well and these starts to build up. Severe decreased eGFR 15–29 mL/min per 1.73 m^2.

Stage 5 - It is also called End-stage renal diseases (ESRD), here kidney functions are severely impaired or patients may have kidney failure. Kidneys barely work well to keep the person alive, with much lower decreased eGFR of < 15 mL/min per 1.73 m^2.[4]

Estimated Glomerular Filtration Rate (eGFR) is considered as the best index to measure kidney function and changes according to the patient´s age, gender, race and serum creatinine level. As CKD progresses, the level of creatinine in the blood rises. eGFR is equivalent to the sum of the total individual filtration rates of the remaining functioning nephrons. The normal value of healthy kidney function in young adult men and woman is approximately 125 mL/min/1.73m^2 and after 30 years of age it reduces by an average of 1 mL per minute per 1.73 m^2 per year.[5]

The burden of illness of CKD is high worldwide and it is a major public health problem due to its increasing incidence and prevalence. Global Burden of Disease study, stated that globally in 2017, there were 697. 5 million cases of CKD. Approximately 1·2 million (95%) people died from CKD. Globally all-age mortality rate from CKD increased 41·5% between 1990 and 2017.[6] The burden of CKD in India cannot be estimated accurately. In western countries, diabetes mellitus and hypertension account for over 2/3rd of the cases of CKD. Even in India, diabetes mellitus and hypertension accounts for 40–60% cases of CKD. According to the recent data of ICMR, prevalence of diabetes mellitus in Indian adult population has risen to 7.1%, (varying from 5.8% in Jharkhand to 13.5% in Chandigarh) and in urban population (over the age of 40 years) the prevalence is as high as 28%.A study was published in a recent issue of the journal from a rural belt of Karnataka. The population had a mean age of 39.88 ± 15.87 years with 3.82% prevalence of DM Type 2 and 33.62% of HTN.[7]

Comorbidity is the presence of one or more additional diseases co-occurring with a primary disease in a person at the same time. CKD patients with comorbidity is associated with worse treatment outcomes, long duration of hospitalization, polypharmacy and increased healthcare costs, when compared to the patients with the presence of a single chronic condition, perhaps due to a high burden of comorbidity.[8,9]

The purpose of this study was to comprehend multiple comorbidities found in CKD patients and unravel the demographic characteristics to explore whether these factors are associated with CKD. In addition, it also highlights the necessity to manage these associated comorbid conditions and individualize patient's treatment by inculcating information of patient's demographic characteristics which plays a major role in increasing life expectancy of patients by furthermost retardation of the disease progression to the full-blown ESRD.

MATERIALS AND METHODS
Duration of study
The study was conducted for a period of six months from June 2019 to December 2019.

Place of study
The study was conducted at multi-speciality hospital, Bengaluru.

Study design
A hospital based prospective observational study design.

Ethical clearance
Obtained from the institution.

Sources of data and materials
- Patient case sheet
- Laboratory data
- Medication / treatment chart
- Suitable self-designed data collection form

STUDY CRITERIA
Inclusion criteria
- Inpatients
- Adults and geriatrics
- Patients of either gender
- Patients diagnosed as CKD
- Patients with all types of comorbidities were included.

Exclusion criteria
- Outpatients
- Pregnant women
- Paediatrics
- The case files with insufficient data

Method of data collection
Patient data was collected from medical records and interviewing patients with open-ended questions. Collected data was recorded in self-designed patient data collection form.

Patient Data Collection Form
A self-designed data collection form was used to record the patient's specific information. The format would provide the information regarding age, gender, education level, lifestyle, economic status, occupation, data of

admission, complaints on admission, past medical and medication history, social history, comorbidities, physical examination, laboratory investigation, diagnosis, drug treatment chart.

Study procedure
This was a prospective observational study, the patient who satisfied the inclusion criteria was considered for study with the help of patient consent form. All patients admitted in the ward were reviewed on daily basis. Patients with known complaint were interviewed with open- ended questions regarding their past medical history and recruited if they met the study criteria. All CKD patient demographic details such as name, age, gender, education level, lifestyle, economic status, occupation, date of admission, reasons for admission, history of previous illness, social history were collected. The comorbid conditions associated among CKD patients were also collected. Information of vitals, laboratory data (haematology test, Blood sugar test, liver function test, urine analysis, renal function test such as serum creatinine, blood urea, etc.), final diagnosis, current treatment drug regimen and other relevant data were collected from case sheets of patients. All the above-mentioned data was entered into the patient data collection form. Patients or their care takers are interviewed regarding patient demographic details, education, lifestyle, social economic status, past medical and medication details. The results of collected data were analysed using statistical analysis and frequencies, percentages, mean value were calculated.

Statistical analysis
The Statistical analysis of collected data was performed using IBM® SPSS version 26 statistical software. The Demographic characteristics were analysed using descriptive statistics. Categorical variables were presented by frequency and percentages. The mean values calculated were written as Mean ± Standard deviation. Differences and association of independent variables were computed using the Pearson Chi-Square test. The 95% confidence interval was maintained during the data analysis and the asymptotic two-sided p-values of less than 0.05 were considered as statistically significant. The analysed results were computed using Microsoft Excel.

RESULTS
The prospective observational study was conducted among one hundred inpatients of CKD with comorbidity for the duration of six months.

Age group classification among study population
Patient were classification has four groups. It was observed that patients of age group 40- 80 (18.9%) were more prone to CKD, followed by as 20-40 (3.7%) 40-60 (18.9%), 60-80 (16.9%) and >80 (1.6%) according to figure 1. The mean age of the CKD patients with comorbidity was 57.59 ± 13.32 years (range:30-86 years).
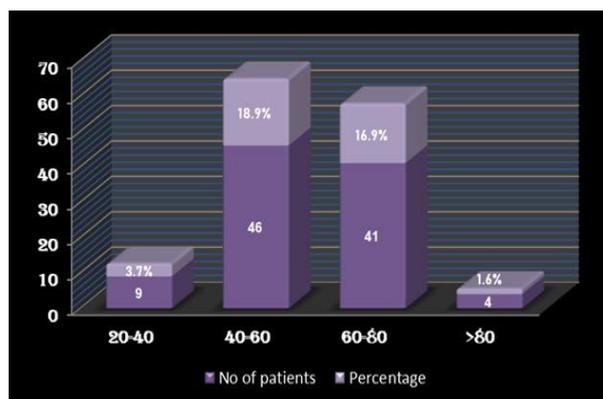

Figure 1: Age group classification (N=100).

Distribution of gender among study participants
The gender distribution among 100 patients of the CKD included 59% of males and 41% of females. Figure 2 shows the distribution of male and females with CKD. Hence more male patients have CKD in current study.
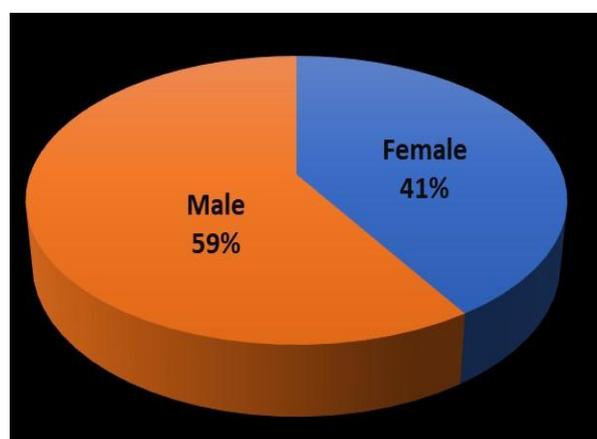

Figure 2: Gender distribution (N=100).

Education level attained by study participants
The figure 3 witnessed that CKD patients completed education with secondary education level (48%) predominantly accompanied by primary education level (23%), degree education level (16%) and least were not schooled (13%).
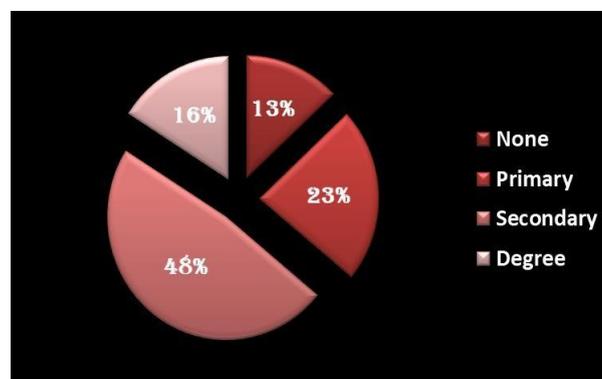

Figure 3: Education level (N=100).

Lifestyle categorization of investigated patients
Patients with moderately active lifestyle (69%) were mostly seen patients with high active (26%) and Sedentary lifestyle (5%) as given in figure 4.
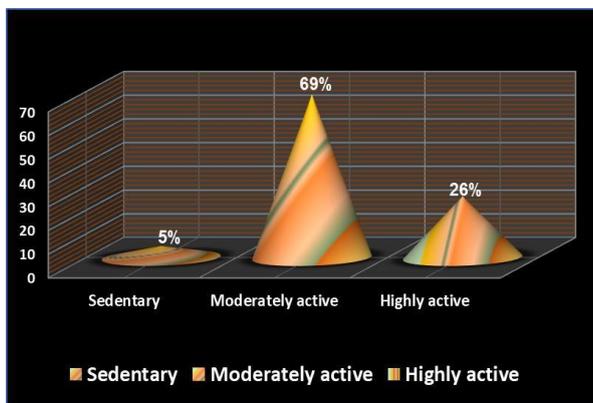

Figure 4: Lifestyle categorization (N=100).

Economic status distribution in study population
In figure 5, economic status of middle income (67%) participants were found to be more affected with CKD than low income (19%) and high income (14%) participants in the study.
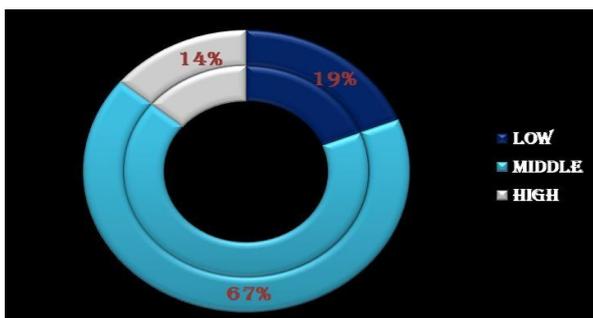

Figure 5: Economic status distribution (N=100).

Unhealthy social habits practiced among study patients
The figure 6, states that among study population 38 patients were alcoholics, 20 patients were smokers and 6 patients were tobacco consumers.
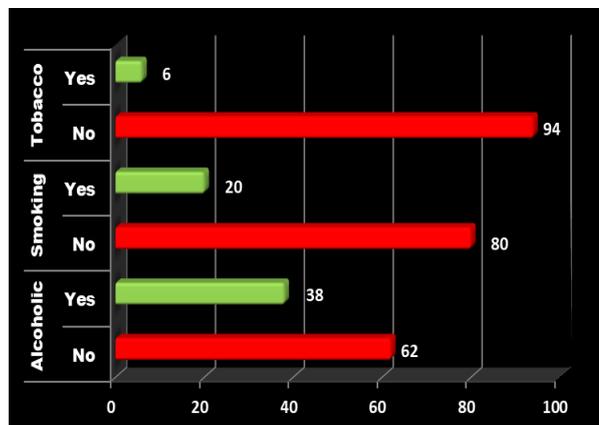

Figure 6: Unhealthy social habits of CKD patients (N=100).

Comparison between major economic status found (middle level) and patient demographics
Highest number of patients enrolled in current study were from middle level economic background (67%) among them 41 patients had social habits such as alcohol (n=25), smoking(n=13) and tobacco(n=3). Maximum of them obtained secondary education level (n=36) and were of moderately active lifestyle (n=47). The greater patients were from 40-60 age group and most of them suffered from two(n=32) and three comorbidities (n=25) in reference to table 1.

Table 1: Patient's middle level economic background (N=67).

Sl. No	Patient Demographics	Middle level Economics	Frequency (n=67)
1	SOCIAL HABITS	Alcoholic	25
		Smoking	13
		Tobacco	3
2	EDUCATION	None	6
		Primary	15
		Secondary	36
		Degree	10
3	LIFESTYLE	Sedentary	1
		Moderately active	47
		Highly active	19
4	AGE	20-40	7
		40-60	31
		60-80	28
		>80	1
5	COMORBIDITY PER PATIENT	1	4
		2	32
		3	25
		4	6

Assortment of stages as per KDOQI guidelines in CKD patients

Among the stages of CKD, the stage IV (38%) was found primarily in this study compared with stage V (33%), stage IIIb (24%), stage IIIa (3%) and II (2%) respectively as linked with table 2.

Table 2: Assortment of stages in CKD patients (N=100).

CKD STAGES	FREQUENCY	PERCENTAGE
II	2	2.0%
III a	3	3.0%
III b	24	24.0%
IV	38	38.0%
V	33	33.0%

Comorbid conditions associated with CKD patients

The predominant comorbidity correlated with CKD as seen in table 3 was Hypertension (30.5%), Diabetes mellitus type 2(27.6%) Anaemia (4.9%), Hyperthyroidism (2.1%) and Chronic Obstructive Pulmonary Disease (2.1%). The other comorbidities less than 2% includes Hyperlipidemia, Hypothyroidism, Ischemic Heart Disease, Coronary Artery Disease, Liver cirrhosis, Cholelithiasis, Hypocalcemia, Upper Gastro Intestinal Bleed, Urinary Tract Infection, Hyperparathyroidism, Cellulitis, Lower Respiratory Tract Infection, Pulmonary edema, Pyelonephritis, Metabolic Acidosis and Renal calculi.

Table 3: Comorbidities associated with CKD patients (N=100).

Comormidity	Frequency	Percentage
Hypertension	74	30.5%
Diabetes mellitus type2	67	27.6%
Anaemia	12	4.9%
Hyperthyroidism	5	2.1%
Chronic Obstructive Pulmonary Disease	5	2.1%
Hyperlipidemia	4	1.6%
Hypothyroidism	3	1.2%
Ischemic Heart Disease	3	1.2%
Coronary Artery Disease	3	1.2%
Liver cirrhosis	3	1.2%
Cholelithiasis	3	1.2%
Hypocalcemia	3	1.2%
Upper Gastro Intestinal Bleed	3	1.2%
Urinary Tract Infection	2	0.8%
Hyperparathyroidism	2	0.8%
Cellulitis	2	0.8%
Lower Respiratory Tract Infection	2	0.8%
Pulmonary edema	2	0.8%
Pyelonephritis	2	0.8%
Metabolic Acidosis	2	0.8%
Renal calculi	2	0.8%
Others	34	18.76%
Total drugs	243	100%

Total number of comorbidities identified per CKD patient

The table 4 presented greater number of CKD patients were with two comorbidities (50%) accompanied by three comorbidities (31%), four comorbidities (10%) and one comorbidity (9%) respectively.

Table 4: Total comorbidities identified per CKD patient (N=100).

Total comorbidity	Total patients	Percentage
1	9	9%
2	50	50%
3	31	31%
4	10	10%

Pearson's chi-square test analysis between gender and smoking

Male were more alcoholic (n=36) than female (n=2) and smokers also higher in male (n=19) compared female (n=1). The association between gender and alcohol was significant [x2(1) = 32.35, p=1282E-8], and also the association between gender and smoking was significant [x2(1) = 13.39, p=0.000252] in present study. However, it was found that the association between gender and tobacco [x2(1) =0.21, p=0.644] was not significant in patients enrolled in this study.

Table 5: Gender oriented difference in social habits (N=100) Observed mean value of kidney function test identified CKD patients.

PEARSON'S CHI-SQUARE	ALCOHOLIC	SMOKING	TOBACCO
Male	36	19	3
Female	2	1	3
[X^2 (df)= Value, p value (2-sided)]	[x2(1) = 32.35, p=1282E-8]	[x2(1) =13.39, p=0.000252]	[x2(1) =0.21, p=0.644]
Result	Statistically Significant	Statistically Significant	Not Statistically Significant

The mean value of blood urea was 72.93±42.78 mg/dl, serum creatinine was 4.42±5.39 mg/dl and GFR was 22.34±14.20ml/min/1.73m^2 as per the laboratory repots of CKD patients.

DISCUSSION

The present study was carried out at Bengaluru, for a period of six months with an aim to evaluate the distribution of demographic characteristics and co-morbid conditions among hospitalized chronic kidney disease patient.

In our study, the patients age was divided into four group such as 20-40, 40-60, 60-80 and >80 years. It was evident that majority of patients were under age group 51-60 years (18.9%) and mean age 57.59 ± 13.32 years were diagnosed with CKD. Therefore, the CKD is more prevalent among the elderly population. The age group mentioned was similar to study conducted by C. H. Moideen Kutty Gurukkal et.al., in which patient belonged to the age group ranging from 35 to 80 years with a mean age of 54.42 ± 6.30 years.[10]

In present study one hundred patients were participated out of which demographic details showed that male patients (59%) were more than female patients (41%). This was found alike with the Pranavi Dasari et.al., research whose result said that out of 150 cases, 108 cases were males (72 %) and 42 cases were females (28 %).[11]

According to the categorical distribution, greater number of patients diagnosed with CKD were from middle class economic status (67%), secondary education level (48%) and moderately active lifestyle (69%).

Economic status had quantitative correlation between multiple variables such as education, social habits and comorbid condition among CKD patients. Of those middle class economic (67%) patients were majorly suffered from CKD, reason being more of them completed only secondary education level (n=36) and practiced more unhealthy social habits such as alcoholic (n=25), smoking (n=13) and tobacco (n=3) This economic group of patients had greater number of comorbidity and generally suffered from two (n=32) or three(n=25) comorbid condition, which was topmost compared to other economic level patients. Most of these patients belonged to middle age group.

It was also found that the overall 38% patients were alcoholics, 20% patients were smokers and 6% patients consume tobacco in this study. The association of each social habits in relation to gender among CKD patients, was analyzed separately using Pearson's Chi-square test. Hence, concluded that the association between gender and alcohol, gender and smoking was significant in the study. However, it was found that there is no association between gender and tobacco among enrolled patients.

The laboratory data is of great importance in diagnosis and management of CKD. In reference to the laboratory report most of the analyzed data were away from the standards of reference. The mean value of blood urea was 72.93±42.78 mg/dl, serum creatinine was 4.42±5.39 mg/dl and GFR was 22.34±14.20ml/min/1.73m^2. This indicates that highest number of patients in present investigation had advanced kidney damage with a severe decrease in kidney function.

CKD is a progressive disease as kidney function continue to decline over time, eventually resulting in kidney failure and death. There are five stages in CKD based on the level of kidney function, the stage IV (38%) was found to be more prevalent in our study followed by stage V (33%) and stage IIIb (24%).

The prevailing comorbidities in alliance with CKD patients were found in the study. Hypertension (30.5%) evaluated to be greatest common comorbidity followed by Diabetes mellitus type 2 (27.6%) the second highest comorbidity, comes after Anaemia (4.9%), Hyperthyroidism (2.1%) and Chronic Obstructive Pulmonary Disease (2.1%). The other comorbidity identified includes Hyperlipidemia, Hypothyroidism, Ischemic Heart Disease, Coronary Artery Disease, Liver cirrhosis, Cholelithiasis, Hypocalcemia, Upper Gastrointestinal Bleed, Urinary Tract Infection, Hyperparathyroidism, Cellulitis, Lower respiratory tract infection, Pulmonary edema, Pyelonephritis, Metabolic Acidosis and Renal calculi. Our exploration is collateral with Sabitha Rose Jacob et.al. in which the common comorbidities included hypertension (61.4%), diabetes (47.3%), cardiovascular disease (30.6%), Chronic obstructive pulmonary disease (10%) malignancies (2.6%), and retinopathy (28%).

The total number of comorbidities integrated with each patient was evaluated in current study. Most of the patient inducted in the study quantified with two comorbidities (20.2%) and three comorbidities (12.8%). There was less patient examined with four comorbidities (4.1%) and one comorbidity (3.7%) among participated CKD patients. Simon D. S. Fraser et al., supported our study concluded that 78/1741 (4 %) had no comorbidities, 453/1741 (26 %) had one, 508/1741 (29 %) had two and 702/1741 (40 %) had >2 in their study.[12]

CONCLUSION
The present prospective observational study was able to estimate the patient's demographic characteristics and identify the comorbidities associated with CKD. Current investigation determined that higher number of patients diagnosed with CKD fall around middle age group with mean age 57.59 ± 13.32 years. Out of one hundred patients' males were found to be more than females. The overall demography of the patients stated that maximum of them are from middle class economic background, completed secondary education level and adopted moderately active lifestyle. It was seen that middle class economic patients had more CKD because most of them were less educated and also had more unhealthy social habits. All together 38% patients were alcoholic, 20% patients were smokers and 6% patients consumed tobacco. The males had these unhealthy social habits more than females and education played an important role since patient with higher education degree had less unpleasant social habits. The CKD patient with comorbidity had the following mean value of blood urea 72.93±42.78mg/dl, serum creatinine 4.42±5.39mg/dl and

GFR 22.34±14.20ml/min/1.73 m^2. On the whole CKD patients examined were mostly in stage IV. The top five comorbidity found in CKD patient was Hypertension (30.5%), Diabetes mellitus type 2 (27.6%) Anaemia (4.9%), Hyperthyroidism (2.1%) and Chronic Obstructive Pulmonary Disease (2.1%). The lesser found comorbidities include malignancies and retinopathy. The majority of patients encountered with two or three comorbidities in present investigation followed by four comorbidities and lastly single comorbidity. On the whole it can be said that even though there is no cure for CKD, the progression of disease can be slowed down or stopped by evaluating and managing its associated comorbidities to prevent further complication of the disease. The treatment can be achieved even better by exploring patient demographic profile and modifying patient's lifestyle accordingly. Social economic condition of the patient should be considered to ease the treatment cost by various healthcare polices. Patient counselling and deaddiction of unhealthy habits like alcohol, smoking and tobacco should be one of the major priorities among CKD patients. The collaboration of clinical pharmacist with other health care professionals is very important for treatment plan, assessment of drug therapy and prevention of inappropriate polypharmacy in the developing country like India.

List of Abbreviations

Abbreviation	Full Form
CKD	Chronic Kidney Disease
KDOQI	Kidney Disease Outcome Quality Initiative
eGFR	estimated Glomerular Filtrate Rate
ESRD	End State Renal Disease
ICMR	International Council Of Medical Research
DM	Diabetes Mellitus
HTN	Hypertension
COPD	Chronic Obstructive Pulmonary Disease
IBM	International Business Machines
SPSS	Statistical Package for the Social Sciences
SD	Standard Deviation

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