Studying Patients with Diabetes, Hypertension and Cardiovascular Risk

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ABSTRACT

Renal diseases like CKD, Acute on CKD, and AKI are the most common health issues in the present situation. Many risk factors cause or increase the incidence of renal diseases and vice versa. In this study, the major comorbidities of renal diseases include hypertension, diabetes, and cardiovascular diseases were included. To assess the co-morbid conditions of diabetes, hypertension, and cardiovascular diseases associated with various levels of renal functions were estimated. In the total 131 patients, 61 (46%) patients were suffering from CKD, 39 (30%) patients were suffering from acute CKD, and 31 (24%) patients were suffering from AKI. The patients of age between 40-50 years were prone to renal diseases in the study. In females, 15 (24%) were suffering from AKI, 33 (52%) were suffering from CKD, and 15 (24%) were suffering from acute CKD. 16 (23%) males were suffering from AKI, 31 (31%) were suffering from CKD and 21 (31%) males were suffering from acute on CKD. In the case of co-morbidities especially in renal diseases, 3 (1%) patients had only CKD, 29 (14%) had CVA, 35 (17%) had DM, 50 (24%) had HTN. The hypertensive patients having CKD were higher when compared to other co-morbidities. Based on the BMI, obese people were highly affected. Proper management and preventive measures should be taken by the people to reduce the occurrence of renal diseases.

Key Words: *Hypertension, Diabetes, Cardiovascular diseases, Chronic kidney disease*

eIJPPR 2021; 11(4):1-5

HOW TO CITE THIS ARTICLE: Thalla S, Hema K, PhaniMounika MNV, Gayatri VHNS, Sri BA. Studying Patients with Diabetes, Hypertension and Cardiovascular Risk. Int J Pharm Phytopharmacol Res. 2021;11(4):1-5. https://doi.org/10.51847/kparDhmy1T

INTRODUCTION

The abnormal renal functions lead to various kidney-related problems mostly Acute Kidney Injury (AKI) and renal failure. Renal failure is one of the leading causes of death in the world. The incidence of CKD (Chronic Kidney Disease) is increased due to the effect of several co-morbidities particularly diabetes, hypertension and other cardiovascular events. In the United States, diabetes, hypertesnsion about 33% and 21% of adult CKD respectively. Generally, people dying with CKD don't reach the final stage of CKD rather they die prematurely due to increased cardiovascular diseases and other co-morbidities [1-4]. The early stages of kidney failure are asymptomatic and mostly unknown. It can be identified by checking the serum creatinine levels and glomerular filtration rate based on age and other clinical conditions. The 5th stage of kidney failure is also known aend-stage renal disease (ESRD) in which the GFR rate is <15 ml/min and the patient should be treated with renal replacement therapy and dialysis**.** The GFR rate can be calculated by using various formulas that consider serum creatinine levels, body weight, age; they are Cock croft-gault formula, Modification of Diet in Renal Disease formula (MDRD), CKD-EPI (Chronic Kidney Disease Epidemiology Collaboration) formula, and Mayo Quadratic formula [5]. This study is based to assess the co-morbid conditions of diabetes, hypertension, and other cardiovascular events associated with various levels of renal function.

The main aim of kidneys is to filter the blood to remove the waste products like toxins and drugs and maintain fluid and electrolyte balance. Kidney failure occurs when the kidneys lose the ability to function properly due to various reasons, which include mainly age, occupation, toxic exposure like chemicals and pollutants, severe dehydration, acute and chronic infections, kidney trauma, etc. The kidneys also fail

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Received: 21 April 2021; **Revised:** 12 July 2021; **Accepted:** 19 July 2021

to functions due to decreased blood flow to kidneys and others; it results in kidney failure/disease conditions. In recent years, CKD is being the most effective condition in people, which is the cause for increased blood pressure, increased blood glucose levels, and cardiovascular risk [6, 7].

MATERIALS AND METHODS

Study site

This study was conducted at Government General Hospital, Vijayawada. It is a 1000 bedded multi-specialty tertiary care teaching hospital. Approximately 400-500 patients are being treated in the General Medicine department per month.

Study design

A hospital based prospective observational study was designed to assess hypertension, diabetes, and cardiovascular risk with various levels of renal functions in patients admitted in the General Medicine department of a tertiary care hospital.

Sample size

Out of 200 patients, 131 were selected from the in-patient wards of the General Medicine department who fulfilled the exclusion and inclusion criteria for the study.

Study duration

The study was conducted for 6 months from August 2019 to January 2020.

Study criteria

The study was carried out by considering the following criteria:

Inclusion criteria

All patients admitted in the General Medicine department with-

- Age: 40-70 years.
- Gender: Male and Female.
- Clinical condition: patients with abnormal renal function or renal diseases

Exclusion criteria

- Age <40 years and >70 years
- Females who were pregnant and lactating

Ethical approval

This study was approved by the Institutional Ethical Committee held on 18-08-2019 at Siddhartha Medical College and Government General Hospital, Vijayawada with Ethical Committee number- **IEC/2019/096B/SMC**

Data analysis

The data collected was analyzed and calculated to assess the possible co-morbidities like hypertension, diabetes, and cardiovascular risk that occurs in patients with abnormal kidney functions (for example CKD, AKI) based on age, gender, BMI, smoking, and alcoholic habits. The percentages are also done to know the rate of co-morbidities in the tertiary care hospital.

Statistical analysis

Statistical analysis was done based on the chi-square test and MS excel 2007

RESULTS AND DISCUSSION

This prospective observational study was done in the Government General hospital, Vijayawada from August 2019 to January 2020 to assess the co-morbidities in patients with abnormal renal functions. In this study, we selected 131 cases out of 200 with abnormal renal functions mainly focused on serum creatinine and GFR rate. Based on the laboratory values of serum creatinine and GFR, the patients were diagnosed with various renal diseases like CKD, acute on CKD, and AKI. Along with the diagnosis, we also collected the other co-morbid conditions present in the patients such as hypertension, diabetes, cardiovascular disease, and anemia, which are the most common conditions associates with renal diseases.

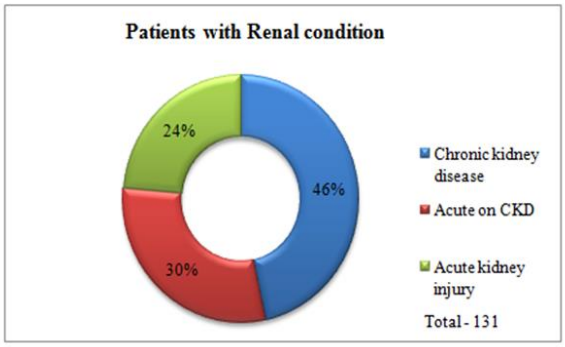

Figure 1. Population distribution based on renal condition

The population distribution of patients with renal conditions is presented in **Figure 1**. In the total of 131 patients, 61 (46%) patients were suffering from CKD, 39(30%) patients were suffering from acute on CKD and 31 (24%) patients were suffering from AKI. Patients with Acute on CKD and AKI were prone to CKD based on their GFR rate.

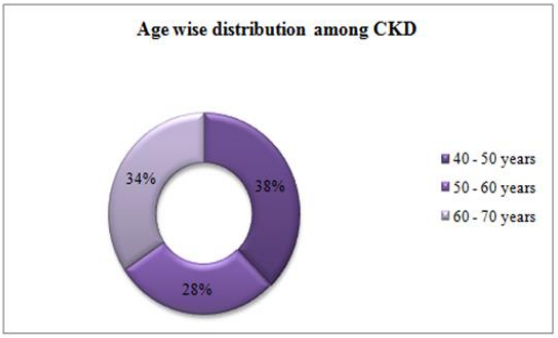

Figure 2. Age-wise distribution of patients with CKD

Age-wise distribution among CKD patients had been presented in **Figure 2**. Ofthe total number of 131 patients, 46% were diagnosed with CKD. Age is inversely proportional to kidney function as age increases, the kidney function decreases. In this study, we have taken the age between 40-70 years patients, in which 23 (38%) patients were in the age group of 40-50 years, 17 (28%) were in 50-60 years age group, and 21 (34%) were in 60-70 years age group.

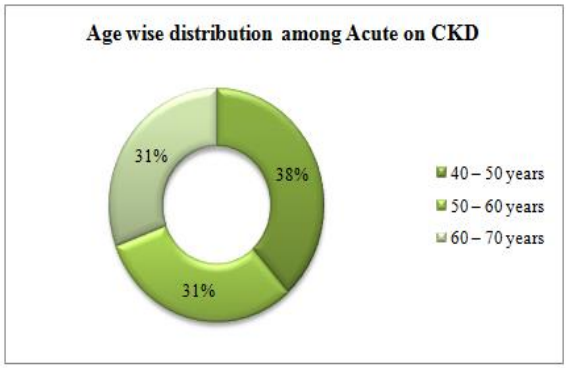

Figure 3. Age-wise distribution of patients with acute on CKD

Age-wise distribution among Acute on CKD patients had been presented in **Figure 3**. In case of Acute on CKD and AKI were also evaluated based on ages. In the case of Acute on CKD, 15 (38%) patients were 40-50 yearsold, 12 (31%) were 50-60 years old and 12 (31%) were in 60-70 years age group.

Age wise distribution among AKI shown in **Figure 4**, in the case of AKI, 16 (52%) patients were 40-50 years old, 11 (35%) were 50-60 years old and 4 (11%) were 60-70 years of age. The patients aged 40-50 years were prone to renal diseases in the study.

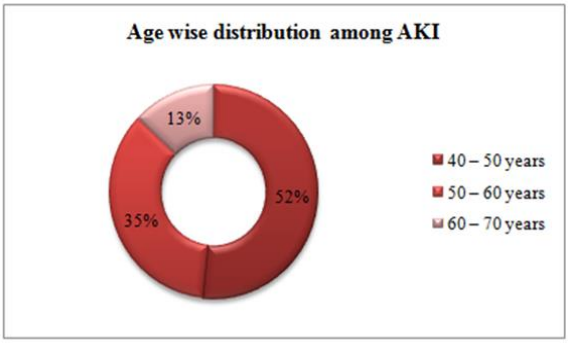

Figure 4. Age-wise distribution of patients with AKI

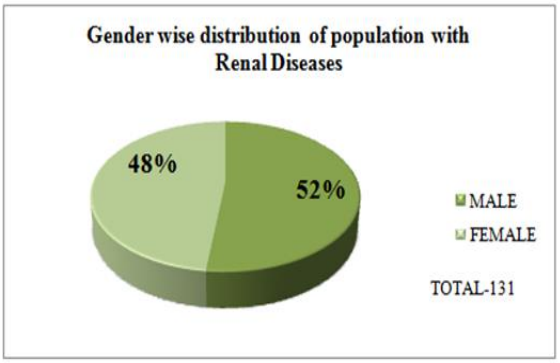

Figure 5. Gender wise distribution of population with Renal Diseases

Gender-wise distribution of patients with Renal Diseases has been presented in **Figure 5**. In this study, 68 (52%) males and 63 (48%) females were found suffering from renal diseases. Males were higher in number than females in the study.

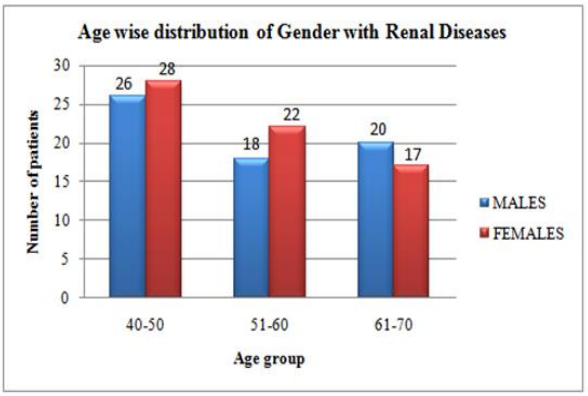

Figure 6. Age-wise distribution of Gender with Renal Diseases

Age-wise distribution of gender with renal diseases havebeen presented in **Figure 6**. The males between 40-50 years of age were 26 (41%) and females were 28 (42%). Males between 51-60 years were 18 (28%) and females were 22 (33%). The patients in the age group 61-70 years were 20 (31%) males and 17 (25%) females. The males and females were higher in the age group between 40-50 years when compared to other groups.

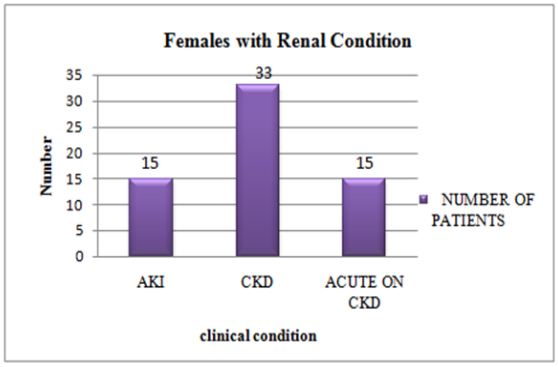

Figure 7. Female Patients with Renal Condition

Females with a renal condition have been presented in **Figure 7**. In the sample size of 131 patients, we evaluated that 63 were females; here we assessed the number of females with particular renal diseases such as CKD, Acute on CKD, and AKI. In females particularly, 15 (24%) were suffering from AKI, 33 (52%) were suffering from CKD and 15 (24%) were suffering from Acute on CKD. From this data, the females suffering from CKD were higher than the other renal conditions. In the sample size of 131 patients, we evaluated that 68 were males; here we assessed the number of males with particular renal diseases such as CKD, Acute on CKD, and AKI. 16 (23%) males were suffering from AKI, 31 (31%) were suffering from CKD, and 21 (31%) males were suffering from Acute on CKD. The majority of males were suffering from CKD when compared to other renal conditions.

Coming to the co-morbidities based on the information collected during the study the major were hypertension, diabetes, and cardiovascular disease. 3 (1%) patients had only CKD, 29 (14%) had CVA, 35 (17%) had DM, and 50 (24%) had HTN. Among CKD patients, 29 (14%) had HTN and DM, 26 (12%) had HTN and CVA, 20 (9%) had DM and CVA, and, 18 (9%) had all of the three co-morbidities i.e. HTN, DM, and CVA.

In acute on CKD condition, 15 (14%) patients had CVA, 16 (15%) had DM, and 35 (33%) had HTN. Amongpatients withAcute on CKD, 13 (12%) had HTN and DM, 12 (12%) had HTN and CVA, 8 (8%) had DM and CVA, and 6 (6%) had all of the three co-morbidities, i.e.HTN, DM, and CVA.

In AKI condition, 8 (22%) patients had only AKI, 5 (13%) had CVA, 7 (18%) had DM, and 8 (22%) had HTN. In patients withAKI, 5 (13%) had HTN and DM, 2 (5%) had HTN and CVA, 1 (3%) had DM and CVA, and 1 (3%) had all the three co-morbidities i.e.HTN, DM, and CVA. Based on the results of the above three conditions (CKD, Acute on CKD, and AKI), the hypertensive patients were more compared to others. Body weight and height are also involved in the occurrence of renal diseases. As the weight increases, there will be more pressure on the spine and affects the kidneys, which results in various diseases. According to the BMI,24 (18%) patients had a normal weight, 52 (40%) were overweight, and 55 (42%) were obese. In these results, the obese and overweight patients were higher than normal weight patients. In the case of males, 11 (17%) patients had a normal weight, 27 (41%) were overweight, and 28 (42%) were obese. In the case of females, 13 (20%) were normal, 25 (38%) were overweight and 27 (42%) were obese. Based on the results, the patients with obese and overweight were higher in both genders compared with normal weighted people. In this study, the taken co-morbidities of renal diseases were hypertension, diabetes, and cardiovascular diseases. Here, we evaluated the number of patients with co-morbidities based on age groups. Firstly, in the case of hypertension, 36 (35%) patients were 40-50 yearsold, 34 (33%) were less than 51-60 yearsold, and 32 (32%) were 61-70 yearsold. From the results, we came to know that the age group 40-50 years were higher when compared to others. In the case of diabetes, 22 (33%) patients were 40-50 yearsold, 22 (33%) were 51-60 yearsold, and 23 (34%) were inthe age group 61-70 years. The patients with diabetes were equivalent in all the age groups. In age groups between 40-70 years, 17 (32%) patients were 40-50 years old, 17 (31%) were 51-60 yearsold, and 20 (37%) were inthe age group of 61-70 years.

In this study, the serum creatinine levels were collected from the lab reports of the patients, the GFR was calculated by using the formula 4-variable MDRD study equation with serum creatinine, weight, and gender. Based on the evaluation in all the patients (131) with different renal diseases like AKI, Acute on CKD and CKD, we got the results with various stages of CKD in which some patients with other diagnoses were also prone to CKD. 1 patient (1%) suffering from stage-I, 2 patients (1%) with stage-II, 10 (8%) patients with stage-III, 17 (13%) patients with stage-IV, and 101 (77%) patients with ESRD (stage-V). The patients with ESRD were higher than other groups in the study.

The Global Burden of Disease study in 2015 showed that around 1.2 million people had died of CKD, and more than 2 million people died in 2010 because they had no access to dialysis. It is estimated that another 1.7 million die from AKI on an annual basis. Chronic kidney disease inthe US is estimated as 11.6% of the population along with 10.6% diabetes, 33.3% hypertension, 36.3% cardiovascular disease [8, 9]. In India, diabetes and hypertension account for 40–60% of cases of CKD, and a prevalence of 17% according to the International Society of Nephrology's Kidney disease Data Center Study. The prevalence of CKD in India hosts 17% of the total earth population. Several issues contribute to a high prevalence of CKD in India [10, 11]. The states like Andhra Pradesh, Odisha, and Goaare prone to high levels of CKD of unknown etiology, which is chronic interstitial nephropathy with insidious onset and slow progression and other parts of south India. In a study conducted in the rural belt ofKarnataka with a mean age of 39.88±15.87 years,the prevalence of diabetes,hypertension, and CKD stage 3 was observed to be 3.82%,33.62%, and6.3%, respectively. The high prevalence of 75% hypertension in rural areas where the population hadnormal or low body mass index was surprising [12]. The incidence of cardiovascular events is seen in 63% of stage 3 and 4 CKD patients compared to 5.8% of adults without any CKD. The highest mortality is seen in cardiovascular diseases associated with CKD than progress to dialysis and cardiovascular events account for 45% of deaths in dialysis patients [13]. In this study, we mainly focused on patients suffering from abnormal renal functions to assess the associated co-morbidities like hypertension, diabetes, and cardiovascular risk based on age, gender, BMI. The present study assessed the co-morbid conditions of diabetes, hypertension, and cardiovascular diseases associated with various levels of renal function.

CONCLUSION

Based on the renal diseases and their co-morbidities in the study, we concluded that CKD is a major health problem. Nowadays, people aged between 40 to 50 years arehighly affected byrenal diseases and particularly males were higher than females due to their habitual changes. The hypertensive patients having CKD were higher when compared to other co-morbidities. Based on the BMI, obese people were highly affected. Anemia, also one of the most common symptoms in many diseases, was higher in CKD patients. Proper management and preventive measures should be taken by people to reduce the occurrence of renal diseases.

Acknowledgments: We gratefully acknowledge the Doctors of Nephrology department and Medicine department of Government General Hospital (GGH), Vijayawada, and Dr. K. Padmalatha, Principal of Vijaya Institute of Pharmaceutical Sciences for Women for support.

Conflict of interest: None

Financial support: None

Ethics statement: This study was approved by the Institutional Ethical Committee held on 18-08-2019 at Siddhartha Medical College and Government General Hospital, Vijayawada with Ethical Committee number-IEC/2019/096B/SMC

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