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Prevalence of Chronic Kidney Disease in Patients with Cardiovascular Disease

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Abstract

Background: Chronic kidney disease (CKD) is a worldwide public health alarming problem. Although both heart and kidneys are separated by a quite distance within the body and they perform varied functions, there is a close physiological relationship between them. The diseases in the kidneys can trigger a disease in the heart and vice versa. High blood pressure is the most significant risk factor for the development and progression of chronic kidney disease (CKD). Lowering blood pressure is a goal to prevent CKD progress. Chronic abnormalities in cardiac function (e.g., chronic congestive heart failure) causing, chronic kidney disease and anemia appear to act together in a vicious circle in which each condition causes or exacerbates the other progressive chronic kidney disease. **Objective:** To assess the prevalence of chronic kidney disease in patients with cardiovascular disease at Shebin El-Kom Teaching Hospital and Menoufia University Hospital Cardiology Outpatient Clinic, Menoufia Governorate, Egypt. **Methods:** This is a cross-sectional study that was conducted in Shebin El-Kom Teaching Hospital Cardiology Outpatient Clinic, Menoufia University Cardiology Outpatient Clinic from April 2019 to July 2019. This study included 200 patients with cardiovascular disease or hypertension for more than 6 months. All patients were subjected to detailed history taking, clinical examination, laboratory investigation, echo and abdominal ultrasound. **Results**: This study included 200 patients with cardiovascular disease or hypertension for more than 6 months, which showed that: 63 (31.5%) were diagnosed as chronic kidney disease, 24 (38%) known to be CKD, 39 (62%) not known diagnosed in our study. Uncontrolled hypertension, congestive heart failure, diuretics and ACEI or ARBS with diuretics together are significant risk factors for renal impairment; uncontrolled hypertension and diuretics are the most predictors for renal impairment. **Conclusion:** Uncontrolled hypertension is the most preventable cause of renal impairment; RAAS not cause renal impairment but lead to de-

creased GFR in CKD patients. We should be careful with ACEI or ARBS with diuretics or diuretics only and control congestive heart disease to avoid kidney injury and chronic cardiorenal.

Keywords

Uncontrolled Hypertension, Congestive Heart Failure, Chronic Kidney Disease, Diuretics, ACEI or ARBS

1. Introduction

Chronic kidney disease (CKD) is a global health burden with a high economic cost to health systems and is an independent risk factor for cardiovascular disease (CVD). All stages of CKD are associated with increased risks of cardiovascular morbidity, premature mortality, and/or decreased quality of life [1].

Chronic kidney disease (CKD) is the progressive and irreversible diminishing of kidney function, which leads to the accumulation of both toxins and fluid within the body [2].

Although both heart and kidneys are separated by a quite distance within the body and they perform varied functions, there is a close physiological relationship between them. The diseases in the kidneys can trigger a disease in the heart and vice versa [2] [3].

Hypertension and cardiovascular disease (CVD) are acknowledged to be integrally linked with CKD [3].

There is a graded inverse relationship between CVD risk and glomerular filtration rate (GFR) that is independent of age, sex and other risk factors [1].

Erythropoietin Hormone; secreted by the kidney; is decreased in chronic kidney diseases that leads to decrease in red blood cells production and hence leads to anemia. This anemia can leads to left ventricular hypertrophy with or without anemic heart failure [4].

Congestive heart failure, chronic kidney disease and anemia appear to act together in a vicious circle in which each condition causes or exacerbates the other [5].

Systemic hypertension is transmitted to intra-glomerular capillary pressure leading to glomerulosclerosis and loss of kidney function; thus variable risk of impaired renal function has been reported among hypertensive subjects [6].

Early diagnosis and treatment of the underlying cause and/or the institution of secondary preventive measures are imperative in patients with chronic kidney disease (CKD). These steps may delay, or possibly halt, progression of the disease [5] [6].

We aimed by this study to assess the prevalence of chronic kidney disease in patients with cardiovascular disease at Shebin El-Kom Teaching Hospital and Menoufia University Hospital Cardiology Outpatient Clinic, Menoufia Governorate, Egypt.

2. Patient and Methods

This was a cross-sectional study including 200 patients known to be cardiac included hypertension for more than 6 months at Shebin El-Kom Teaching Hospital Cardiology Outpatient Clinic, Menoufia University cardiology outpatient clinic from April 2019 to July 2019.

Inclusion criteria:

1) Hypertension.

2) Patients with ischemic heart diseases.

3) Patients with congestive heart failure.

4) Patients with rheumatic and valvular heart diseases.

5) Age > 18 yr and <80 yr.

Exclusion criteria:

1) Patients with decompensated chronic liver disease.

2) Patients with terminal malignancy.

3) Age < 18 yr and >80 yr.

4) Diabetic patient.

5) Patient diagnosed as nephrotic syndrome.

6) Patient with psychiatric and mental illness.

Informed consent was obtained from the patients after explaining the research. All study procedures were carried out and approved by the Ethical Committee of Menoufia Faculty of Medicine. Detailed history, Laboratory investigation, Doppler ultrasound and clinical examination was done for all patients with stress on:

1) Medical history of patients known to be hypertension for long time for more than six-month history take ACE or ARBS or and diuretics for more than 6 months, patient diagnosed previously as rheumatic heart disease, congestive heart failure or vulvlar heart disease by echocardiogram for more than 6-month history of diuretic use or ACE or ARBS for more than 6 months. Ask about hypertension controlled on treatment. BP controlled systolic Bp < 130 and diastolic Bp < 80 (American heart association, 2018).

2) Examine pulse.

3) Measure blood pressure to detect if controlled or not Blood pressure was measured by a trained technician using a mercury sphygmomanometer and calculated as the average of 3 or 4 measurements, excluding the first measurement. Adequate blood pressure control was defined SBP < 130 mm Hg and DBP < 80 mm Hg for all adults < 65 years of age and for adults ≥ 65 years of age with diabetes mellitus. Pulse pressure was calculated as the difference between systolic and diastolic blood pressure; wide pulse pressure was defined as >80 mm Hg [7].

4) Examination of congested neck veins and lower limb for detect patient in congestion in congestive heart failure.

5) Auscultation of first and second heart sound and additional heart sound to detect valvular heart disease.

6) Laboratory investigations include Hb (gm/l), Urea (mg/dl), Creatinine (mg

/dl), ACR (mg/gm), HbA1c (mmol/mol), Cholesterol (mg/dl)), Triglycerides (mg/dl)), LDL (mg/dl)), HDL (mg/dl)).

We measure urea, creatin and alb/creatin ratio in two occasions three months in between then estimate GFR by EPI CKD equation (chronic kidney disease epidemiology collaboration) [8].

Estimated glomerular filtration rate (eGFR) (ml/min/1.73m^2) calculate by EPI ckd equation (chronic kidney disease epidemiology collaboration):

(GFR = 141 × min (Scr/κ, 1) α × max (Scr/κ,1) − 1.209 × 0.993 age × 1.018 [if female] × 1.159 [if black], whereas Scr is the serum creatinine value (mg/dL); k is 0.07 for women and 0.9 for men; α is −0.329 for women and −0.411 for men; min indicates the minimum of Scr/κ or 1, and max indicates the maximum of Scr/κ or 1.10) [8].

We classify CKD patients according to Kidgo 2012 (Table 1) [9].

Based on Estimated glomerular filtration rate all patients will be divided into 2 groups:

- **Group I:** patients diagnosed CKD (chronic kidney disease).
- **Group II:** patients diagnosed non CKD (nonchronic kidney disease).

Statistical analysis:

Data were collected and entered into the computer using SPSS (Statistical Package for Social Science) program for statistical analysis, (version 20; Inc., Chicago, IL).

3. Results

This study included 200 patients aged from 30 to 80 years (80 male and 120 female) the mean age of those patients are 59.5 ± 9.7, the mean GFR are 87.03 ± 22.3, the mean BMI was 323.5, 31.5% known to be CKD and, 82.5% known to be hypertensive, 72.5% known to be IHD, 14% known to have congestive heart failure, 9% known to have valvular heart disease, 76.5% take ACEI/ARBs as treatment, 22% take diuretics as treatment, 41% take both ACEI/ARBs and diuretics as treatment as shown in Table 2 we collect patients from cardiology outpatient in Clinic Menoufia University and Shebin El Kom Teaching Hospital exclude diabetic patients as diabetes consider a main predictor for renal impairment worldwide. Compare between all patients regarding labs as shown in Table 3. In our study we divided patients into two groups group 1 patients diagnosed as chronic kidney disease. Group 2 patient diagnosed nonchronic kidney disease according GFR by EPI. We made comparison between two groups regarding demographics as shown in Table 4 we found that congestive heart failure, uncontrolled hypertension, diuretics and diuretics and ACEI or ARBS together are significant risk factors in comparison between two groups as shown in Figure 1 and Table 4.

Prevalence of chronic kidney disease among patients is shown in Figure 2. In our study we detect percent of patients diagnosed previously as CKD which represent as 38% and patients recently diagnosed which represent 62% as shown in Figure 3.

Table 1. Classification of CKD patients according to KIDGO 2012.

GFR category GFR (ml/min/1.73m²)	Terms	
G1	>90	Normal or high
G2	60 - 89	Mildly decreased*
G3A	45 - 59	Mildly to moderately decreased
G3B	30 - 44	Moderately to severely decreased
G4	15 - 29	Severely decreased
G5	<15	Kidney failure

Table 2. Patients demographics of all 200 patients.

Variable	Number (%)
Gender	
Male	**80 (40%)**
Female	**120 (60%)**
CKD	
Yes	**63 (31.5%)**
No	**137 (68.5%)**
Hypertension	
Yes	**165 (82.5%)**
No	**35 (16.5%)**
Hypertension control	
Yes	**96 (58.2%)**
No	**69 (41.8%)**
IHD	
Yes	**145 (72.5%)**
No	**55 (27.5%)**
Congestive HF	
Yes	**28 (14%)**
No	**172 (86%)**
Valvular diseases	
Yes	**18 (9%)**
No	**182 (91%)**
ACEI/ARBs	
Yes	**153 (76.5%)**
No	**47 (23.5%)**
Diuretics	
Yes	**44 (22%)**
No	**156 (78%)**
ACEI/ARBs + Diuretics	
Yes	**41 (20.5%)**
No	**159 (79.5%)**

Table 3. Patients laboratory data of all 200 patients.

Variable	Minimum	Maximum	Mean + SD
Age (Years)	30	80	59.5 + 9.7
BMI (Kg/m²)	23	42	32+3.5
Hb (gm/l)	7.0	17.0	11.7 ± 1.7
Urea (mg/dl)	10.0	160.0	39.1 ± 21.9

Continued

Creatinine (mg/dL)	0.40	3.0	0.96 ± 0.42
ACR (mg/gm)	1.0	1000.0	131.2 ± 204.0
HbA1c (mmol/mol)	4.5	8.0	5.4 ± 0.41
Cholesterol (mg/dl)	100.0	244.0	182.3 ± 31.4
Triglycerides (mg/dl)	55.0	215.0	99.9 ± 32.1
LDL (mg/dl)	50.0	170.0	110.1 ± 24.9
HDL (mg/dl)	17.0	70.0	44.8 ± 9.4
eGFR (ml/min/1.73m^2)	14.0	134.0	87.03 ± 22.3

BMI: body mass index, HB: hemoglobin, ALB/CR: albumin/creatin, LDL: low density lipoproteins, HDL: high density lipoproteins, GFR: glomerular filtration rate, HB A1C: hemoglobin A1C. -SD: standard deviation.

Table 4. Comparison between studied groups patient diagnosed as chronic kidney disease and patient free from renal impairment regarding demographics.

Variable	Group 1 CKD No (63)	Group 2 Non-CKD No (137)	Test	P value
***Age (Years)**	61.3 ± 11.3	58.6 ± 8.8	1.8 (t test)	0.070 (NS)
#Gender				
Male no (%)	26 (41.3)	54 (39.4)	0.062 (x2)	0.804 (NS)
Female no (%)	37 (58.7)	83 (60.6)		
BMI (kg/m^2)	31.6 ± 3.9	32.2 ± 3.4	0.791 (U)	0.429 (NS)
Hypertension				
Yes no (%)	56 (88.9)	109 (79.6)	2.6	0.107 (NS)
No no (%)	7 (11.1)	28 (20.4)		
Hypertension control				
Yes no (%)	10 (17.9)	86 (78.9)	61.2	0.000 (S)
No no (%)	46 (82.1)	23 (21.1)		
IHD				
Yes no (%)	41 (65.1)	104 (75.9)	2.5	0.111(NS)
No no (%)	22 (34.9)	33 (24.1)		
Congestive HF				
Yes no (%)	14 (22.2)	14 (10.2)	5.1	0.023 (S)
No no (%)	49 (77.8)	123 (89.8)		
Valvular Disease				
Yes no (%)	7 (11.1)	11 (8.0)	0.500	0.479 (NS)
No no (%)	56 (88.9)	126 (92.0)		
ACEI/ARBs				
Yes no (%)	48 (76.2)	105 (76.6)	0.005	0.944 (NS)
No no (%)	15 (23.8)	32 (23.4)		
Diuretics				
Yes no (%)	23 (36.5)	21 (15.3)	11.2	0.001 (S)
No no (%)	40 (63.5)	116 (84.7)		
ACEI/ARBS + Diuretics				
Yes no (%)	23 (36.5)	18 (13.1)	14.4	0.001 (S)
No no (%)	40 (63.5)	119 (86.9)		

***: Mean + Standard deviation, #: Chi square. *** BMI: body mass index, IHD: ischemic heart disease, congestive HF: congestive heart failure. ACEI: angiotensin receptor blockers, ARBS: angiotensin converting enzyme inhibitor.

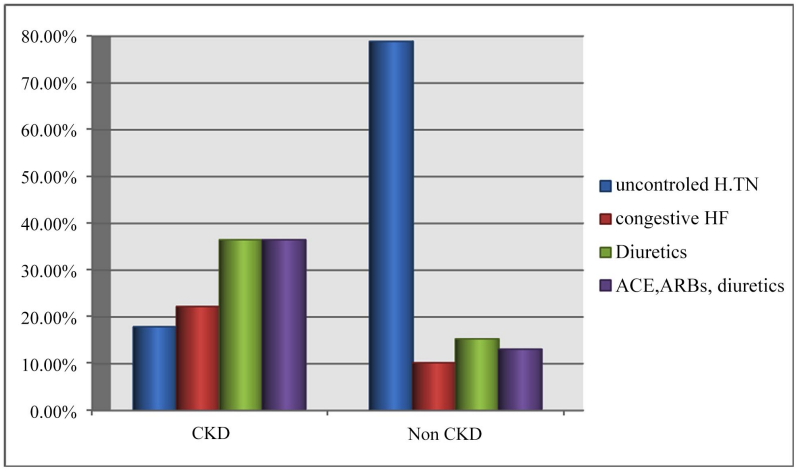

Figure 1. Comparison between CKD and non CKD patients.

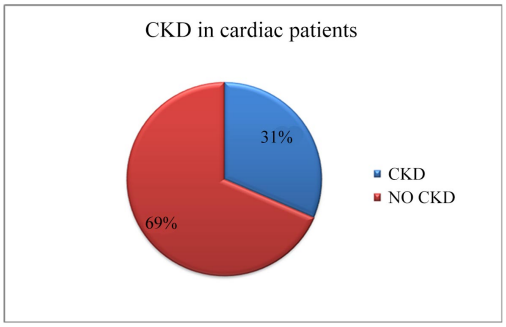

Figure 2. Prevalance of chronic kidney disease.

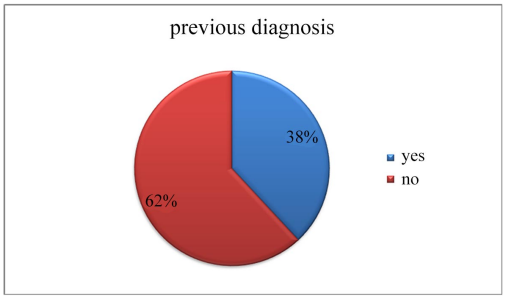

Figure 3. Patients diagnosed having CKD in our study (n = 63).

We classify CKD patients according to GRF by EPI equation to 5 stages according to (Kidigo, 2012) as shown in **Figure 4** we found that CKD patients in our study were in stage 3 which represent 40.3% of patient.

We made univariant binary logistic regression analysis to detect the prediction of significant risk factors for renal impairment which shows that diuretics, congestive heart failure, uncontrolled hypertension and diuretics with ACEI or ARBS together as shown in **Table 5**.

Then we made a multivariant binary logistic regression to detect prediction of risk factors to be significant to renal failure as shown in **Table 6** we found that uncontrolled hypertension and diuretics are the more predictor risk factor.

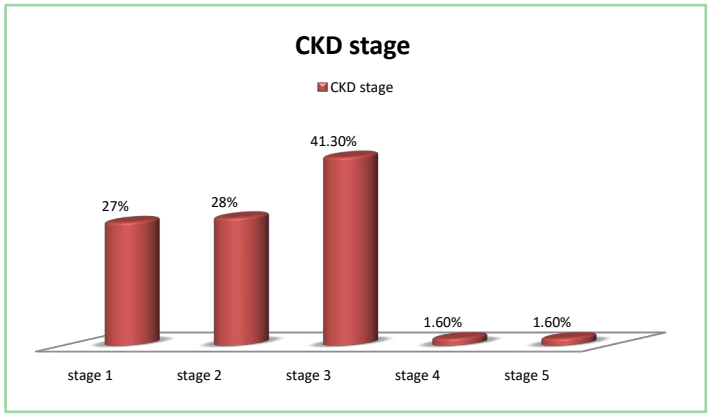

Figure 4. Stages of CKD in cardiac patients (n = 63).

Table 5. Univariate binary logistic regression analysis.

Variable	Univariate binary logistic regression analysis	
	Odd (CI 95%)	P value
uncontrolled H.TN	17.2 (7.5 - 32.8)	0.000
Congestive HF	2.5 (1.1 - 5.7)	0.02
Diuretics	3.2 (1.6 - 6.3)	0.001
ACEI/ARBs + Diuretics	3.8 (1.9 - 7.8)	0.000

*Congestive HF Congestive heart failure, ACEI: angiotensin converting enzyme inhibitor, ARBs: amgiotensin receptor blocker.

Table 6. Multivariate binary logistic regression analysis.

Variable	Multivariate binary logistic regression analysis	
	Odd (CI 95%)	P value
uncontrolled H.TN	17.3 (7.2 - 42.1)	0.000
Congestive HF	2.4 (0.56 - 10.4)	0.237
Diuretics	5.3 (1.4 - 19.3)	0.010
ACEI/ARBs + Diuretics	1.9 (0.666 - 5.7)	0.224

*Congestive HF Congestive heart failure, ACEI: angiotensin converting enzyme inhibitor. ARBs: amgiotensin receptor blocker.

4. Discussion

Chronic kidney disease (CKD) is a major health care problem due to its associated high morbidity and mortality, increasing prevalence, and elevated costs [10].

A reduction in glomerular filtration rate (GFR) has been related with an increase in the risk of cardiovascular complications and greater morbidity and mortality the high prevalence of CKD is known in patients who either have or are at a high risk of having cardiovascular disease [11].

Impaired renal function independently increases the risk of death, cardiovascular death and hospitalization for worsening heart failure in patients with

chronic heart failure (CHF) The main determinant of renal function in CHF is renal blood flow [12].

Chronic heart failure (CHF) is common, is an important cause of hospitalizations, and is associated with significant morbidity and mortality. Renal disease in patients with heart failure is multi-factorial. Renal function may act as a barometer of cardiac function [13].

Our study across sectional study was carried out in cardiology outpatient clinic at Shebin El-Kom Teaching Hospital, Menoufia University, Menoufia from April 2019 to July 2019 to assess prevalence of chronic kidney disease in patients with cardiovascular disease.

Two hundred patients were included in this study, 40% males and 60% females, with ages ranged from 30 to 80 years old**.**

All of them were cardiac which were rheumatic or hypertensive or congestive heart disease or all of them for at least 6 months duration we exclude diabetic patient as diabetes main predictor of renal impairment. We divide patients to two groups as follow:

- Group 1—patients diagnosed as CKD according to EPI GFR.
- Group 2—patients not diagnosed CKD according to EPI GFR.

This study aimed to detect prevalence of chronic kidney disease in cardiac patients.

In our study result demonstrated that prevalence of CKD was 63 patient with percent (31%) of total patient the same study done in Spain Gorostidi *et al.* [14] unlike our study prevalence of CKD was 15.1% and same study reported in Brazil by Alves *et al.* [15] in which prevalence was 36.6% this similar to our study.

Our result was also similar with a same study reported in Spain by Amenós *et al.* [11] in which prevalence of CKD was 37.3%.

In our study we divide CKD patient to a group who are known and diagnosed before as CKD which represent 38% (24 pt) of CKD patient with 12% of total and another group which screened in our study which represent 62% (39 pt) of CKD patient around 19.5% of total population this explain increase the percent of screening in our study and awareness of CKD is low.

Unlike another study reported in Spain by Amenós *et al.* [11] patient established CRF 18.9% and patient occult CRF 18.2% two groups are equal in number our result nearly similar to another study reported in America 29% were aware of their CKD Murphy *et al.* [16]

We classify CKD patients according to GRF by EPI equation to 5 stages according to Kidigo (2012) we found that the largest number of CKD patients in our study were in stage 3 which represent 40.3% of patient and this refers to our patient careless and not aware we also found that stage 1 present 27%, stage 2 present 28%, stage 4 represent 1.6%, stage 5 represent 1.6%, this also found in another study reported in Spain by Gorostidi *et al.* [14] in which stage 3 represent the largest number 11.6% stage 1, 2, 4 and 5 were 1.8%, 1.6%, 0.2% and 0.0% of subjects.

And also agree with study reported in Brazil by Alves *et al.* [15] in which stage

1 (19%), stage 2 (31%), stage 3 (35.8%), stage 4 (9.5%) and stage 5 (4.8%). also agree with study reported in Spain in which 83.1% had stage 3; 14.8% stage 4; and 2.1% stage 5 Amenós *et al.* [11]. unlike result of study reported in BRAZIL in which stage 3 was 2.3% although this study show different population than we collect and also disagree with study reported in America compare between American African regarding controlled hypertension 25% had stage 1, 35% had stage 2, 33% had stage 3, and 6% had stage 4 CKD Murphy *et al.* [16].

In our study we compare between two groups regarding some demographics and risk factor to detect the most risk factor for renal impairment.

Our result demonstrated no significant difference between two groups regarding hypertension, age, gender, BMI, IHDS and vulvlar heart disease.

BMI ranges in our study from 23 to 41 with mean 32 ± 3.5. We found no significant difference between two groups regarding BMI and this similar to Amenós, *et al.* [11] in which BMI did not differ widely between two groups but chronic renal failure affects more the obese patient.

We found no significant difference between two groups regarding age but CKD affected the older more than this agree with Gorostidi *et al.* [14] Individuals with CKD were older than subjects with normal renal parameters (61.5 vs. 44.4 years), and were predominantly and agree with Amenós *et al.* [11] in which no significant difference regarding age but CRF more in old patient.

In our study we found no significant difference regarding gender but female affected more than male affected with 58.7% and male 41.3% this agree with Amenós *et al.* [11] male affected with 25% and disagree with Gorostidi *et al.* [14] in which male affected more than 3-fold higher in men than in women (23.1% vs. 7.3%), men affected with (75.4%).

Our result demonstrated that Number of patient of vulvlar heart disease around 9% of total population and ischemic heart disease represent around 72.5% of total population prevalence of CKD in vulvlar and IHDS was 11.1% and 65.1% of CKD we found no significant difference between two groups regarding IHDS and vulvlar heart disease this agree with Song *et al.* [17] in which no significant difference regarding renal function frequent occurs in elderly regarding vulvlar heart disease and profoundly affect long-term outcomes.

Our result demonstrated hypertensive patients around 165 patients with percent 82.5 our result disagree with study reported in Spain by Gorostidi *et al.* [14].

In our study hypertension represent around 37% of total population prevalence of CKD in hypertension patient was 28% of all subject and with 88.5% percent of CKD patients this explains that hypertension the major cause of CKD this disagree with Alves *et al.* [15] a same study in al brazil in which prevalence of CKD in hypertensive patient was 17.3%.

Our result demonstrated that hypertension is the most effective cause of renal impairment but there is no significant difference between two groups regarding hypertension as hypertension patient around 78.9% of non CKD patients agree with study reported in Spain by Amenós, *et al.* [11] in which hypertension in CKD patient was 91.8% and 78.7% of non CKD patients there was no significant

difference between two groups.

In our study we found that uncontrolled hypertension the most effective risk for renal impairment patient with CKD and uncontrolled hypertension around 82.1% of all CKD patient and control hypertension is important preventable cause for renal impairment as 17.9% of controlled get CKD and 78.9% of non CKD patient this similar to study reported in America by Murphy *et al.* [16] in which percent of CKD in uncontrolled hypertension around 73%. Also agree with another study reported in Saudi Arabia by Almalki *et al.* [18] in which uncontrolled hypertension 78.1% and associated with more comorbidity like renal impairment.

Our result demonstrated that ischemic heart disease 145 patient with percent 72.5% of total patient, congestive heart failure 28 with percent 14% of total patient and vulvlar heart disease 18 with percent 9% of total patient prevalence of CKD in with 65.1% in IHDS, and 22.2% in congestive HF and 11.1% in vulvlar diseases disagree with study reported in Spain Gorostidi *et al.* [14] cardiovascular disease represent about 2.2% of all population with prevalence of CKD around 15.1% in CVD disagree with another study reported in United States by George *et al.* [19] in which prevalence of CKD in HF was 28.3% and 22% the percent of decline in GFR and there is a significant difference regarding H.F like our study prevalence of CKD in non-congestive HF was 1.6% this explain that uncontrolled congestive heart failure is often associated with a rapid fall in renal function and adequate control of congestive heart failure can prevent progress of renal impairment.

Also our study demonstrated significant difference between two groups regarding uncontrolled hypertension, congestive heart failure, diuretics and ACEI/ARBS + diuretics.

Our result demonstrated that prevalence of CKD with history of diuretics were 44 patient with percent of 22% of total patient disagree with *study* reported in Al Brazil by Alves *et al.* [16] in which *percent* of diuretic use 78%. Our result demonstrated that *prevalence* of CKD with diuretics around 36.5% of CKD patients and around 11.5% of all patients. there is a significant difference between two groups regarding diuretic use this agrees with a study reported in Europe by De Silva *et al.* [20] compare between diuretic use for more than 6 months in H.F regarding kidney dysfunction in this study prevalence of kidney dysfunction in group taking diuretics around 63% increase risk of kidney dysfunction with 50% and there was a significant difference regarding diuretic use.

In current study 153 patient take ACEI or ARBS with percent 76.5% this agree with percent of study in brazil by Alves *et al.* [16] in which, 67% take ACEI and 4.5% receiving ARBs our result demonstrated prevalence of CKD with ACEI or ARBS was 76.2% of *CKD* patient and 24% of total patient, we found there was no significant difference between two groups regarding history of having ACEI or ARBS agree with study reported in America by McCallum *et al.* [21] in which GFR reduced in a group talking ACE or ARBS statistically increased risk for kidney dysfunction, the risk is limited to the early phase there was no significant

difference between two groups regarding talking ACEI or ARBS prevalence of CKD in ARBS use around 33% *prevalence* of group take placebo around with no significant difference regarding ACEI or ARBS taking.

Our result demonstrated significant difference between two groups regarding decrease parenchyma, decrease length and increase echogenicity this agree with study reported in India by Maneesha *et al.* [22] they found that length decrease and parenchyma last affected in the last stage of CKD and correlate with increase creatinine.

In our result univariant binary logistic regression analysis demonstrated that the more predictive risk factor for renal impairment were uncontrolled hypertension [odds ratio (95% CI), 17.2 (7.5 - 32.8), $p < 0.000$], congestive heart failure [odds ratio (95% CI), 2.5 (1.1 - 5.7), $p < 0.02$], Diuretics [odds ratio (95% CI), 3.2 (1.6 - 6.3), $p < 0.001$] and ACEI/ARBs + Diuretics [odds (95%), 3.8 (1.9 - 7.8), $p < 0.000$].

We made multivariant binary logistic analysis which demonstrated that the most predictive risk factors for renal impairment were uncontrolled hypertension [odds (95% CI), 17.3 (7.2 - 42.1), $p < 0.000$] agree with Murphy *et al.* [16] also agree with Wright *et al.* [23] in which uncontrolled hypertension was the most risk factor for renal impairment and another predictive risk factor for renal impairment is diuretics [odds (95% CI), 5.3 (1.4 - 19.3), $p < 0.010$] agree with Alves *et al.* [14] and disagree with Clark *et al.* [24].

5. Limitation

The study was conducted over a short period and included only 2 centers which may not represent all patients in Menoufia Governorate.

6. Conclusion

Uncontrolled hypertension, diuretics, ACEI OR ARBS together with diuretic and congestive heart failure are the significant risk factors for renal impairment in cardiac patients.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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