Original Research Article

Effect of Hypertension and Diabetes in the Prognosis of Chronic Kidney Disease

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Received: 05-08-2020 / Revised: 20-09-2020 / Accepted: 12-10-2020

Abstract

Introduction: The prevalence of chronic kidney disease worldwide is such that it is now considered as epidemic. DM and HTN are considered as major risk factors for CKD and leads to its progression towards ESRD. **Objective:** The aim of this study was to evaluate the role combined role of DM and HTN in progression of CKD towards ESRD as compared to DM and HTN alone. **Material and methods:** CKD Patients coming to the nephrology OPD of Sri Sankra medical college suffering from DM, HTN or both were included in this study. Patients with some other comorbidities were excluded from this study, also patient's noncompliance towards the treatment were excluded from this study. These subjects were divided into three groups, Patients with Dm+HTN both, Patients with only HTN and Patients with only DM. these subjects were then observed for a period of one year for the progression of CKD into ESRD. **Results:** There was no significant difference in the progression of CKD to ESRD among the three groups. But the higher percentage of patient's suffering from HTN progressed towards ESRD with DM+HTN group closely following. All the three groups though significantly progressed to ESRD. **Conclusion:** we conclude that DM and HTN are major risk factors for the progression of CKD to ESRD although if they have a synergistic effect in the progression of disease can't be proven by our results.

Keywords: Chronic Kidney Disease [CKD], Cardio Kidney Damage, End Stage Renal Disease [ESRD], Diabetes Mellitus, Hypertension.

Introduction

The prevalence of chronic kidney disease (CKD) in general population is estimated to be 14%. Patients suffering from Hypertension (HTN) and diabetes are the main victims. Almost half of the individual suffering from CKD either have diabetes or have HTN. Kidney Disease is one disease which may go unnoticed in early stages until it is very advanced; hence it is also referred to as silent disease. As per the statistics of United States it was observed that women are more likely to have stages 1-4 CKD then men.

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The burden of CKD on Indian population is increasing day by day. The prevalence of CKD was calculated to be 800 per million population (pmp) and out of this population the prevalence of patients progressed into end-stage renal disease was 150 to 200 pmp.

The commonest cause of CKD in Indian population was found to be diabetic nephropathy which was responsible for 41% of the cases. Study conducted by Mani MK found that diabetes and hypertension are the two major risk factors for CKD in India. CKD (Chronic kidney Disease) and HTN (Hypertension) are interrelated global public health problems. HTN may cause CKD or it may be a result of CKD. HTN is also extremely predominant in patients receiving haemodialysis[1,2].

Poorly controlled hypertension is considered as major risk for the patients of CKD. Clinical data suggests that failure to achieve adequate BP control may also contribute to the suboptimal outcomes in CKD.

Essential hypertension is associated with higher cardiovascular morbidity and mortality[3,4] there is another entity which is known as resistant hypertension (RH) and is diagnosed when the patient's BP is not within the goal even after regular use of 3 different antihypertensive drugs which also includes a diuretic agent or elevated BP with 4 or more antihypertensive agents[3]. Pseudo-resistance is very frequently observed in the group of RH patients and some times as many as 37 % of RH patient are found to have pseudo-resistance[5]. Hence to study the exact effect of resistant or sustained hypertension on CKD and vice versa it becomes essential to point out the patients of Pseudo- resistance. There is considerable evidence which indicates that hypertension plays a major role in the progression of most forms of CKD[6].

CKD is a common complication of diabetes mellitus. CKD is projected to affect about 50% patients with type 2 Diabetes Mellitus globally, and its presence and severity evidently influences disease prognosis.

Professor El Nahas coined the term Cardio-kidney disease emphasising the role of Hypertension and diabetes in the CKD. He stated that CKD is the manifestation of CVD[7].

This suggests that the prevalence of CKD is growing day by day in our country. The incidence of diabetes and HTN are also rising rapidly and thus contributing to CKD and ultimately to ESRD increasing the cost of treatment as demand for dialysis and transplant units are increasing with each passing day.

This study is an attempt to observe the prognosis of CKD in patients having both hypertension and DM as comorbidities and to compare the effect of these entities individually in the determination of prognosis of patient of CKD.

Material and Methods

This study was conducted on the patients visiting Depatment of General Medicine, Sri Shankaracharya Institute Of Medical Sciences, Bhilai, Chhattisgarh in August 2019 – January 2020.

A total 490 patients visited the nephrology OPD of Sri Shankra medical college during the time of the recruitment of study, out of these 490 patients 466 patients were included in the study based on the inclusion and exclusion criteria.

Inclusion criteria: Patient's with relevant history of DM or Hypertension or both were included in the study.

Exclusion Criteria :Patient with any other co morbidity like UTI, Nephritic syndrome, pregnancy, acute kidney injury, SLE, RA, Collagen Disorder, HIV and Polycystic kidney disease and Patient noncompliance to treatment were excluded from the study.

The selected patients were then grouped according to age, sex and comorbidities.

Patients were grouped according to the comorbidities into 3 groups.

- Group1 – Patients with DM, HTN with CKD,
- Group 2 – Patients with HTN with CKD
- Group 3- Patients with DM with CKD

These patients were then followed for a period of one year since the day of their recruitment and the progress of their disease was measured and all the necessary treatment was provided to these patients. Patients of CKD and ESRD were differentiated based on the dependence on the dialysis and GFR.

Results were then tabulated and analysed by using the Chi square test of SPSS software.

Results

Table 1: Distribution according to the age group

Age Group	Male	Female	Total
<20yrs	2	1	3
21-30	18	15	33
31-40	38	44	82
41-50	54	55	109
51-60	95	70	165
61-70	49	17	66
>70	18	14	32
Total	274	216	490

Table 2: Shows the statistical comparison of males and females with in the groups in CKD

	HT+DM	HT	DM	Row Totals
Males	78 (91.45) [1.98]	130 (125.98) [0.13]	90 (80.58) [1.10]	298
Females	65 (51.55) [3.51]	67 (71.02) [0.23]	36 (45.42) [1.96]	168
Column Totals	143	197	126	466 (Grand Total)
[the chi-square statistic for each cell] The chi-square statistic is 8.8983. The p-value is .011689. The result is significant at $p < .05$.				

Table 3: shows the statistical comparison of males and females with in the groups in ESRD patients

	Male	Female	*Row Totals*
HT+DM	47 (50.52) [0.24]	14 (10.48) [1.18]	61
HT	74 (72.88) [0.02]	14 (15.12) [0.08]	88
DM	38 (35.61) [0.16]	5 (7.39) [0.77]	43
Column Totals	159	33	192 (Grand Total)
[the chi-square statistic for each cell] The chi-square statistic is 2.4584. The *p*-value is .292533. The result is *not* significant at $p < .05$.			

Table 4: relationship of groups with the progression of CKD to ESRD

Groups	Patient did not progress to ESRD	Patient progress to ESRD	Total	p-value
HT+DM	82 (84.08) [0.05]	61 (58.92) [0.07] 42.65%	143	p<0.05
HT	109 (115.83) [0.40]	88 (81.17) [0.58] 44.67%	197	p<0.05
DM	83 (74.09) [1.07]	43 (51.91) [1.53] 34.12%	126	p<0.05
Total	274	192	466	
[the chi-square statistic for each cell]. The chi-square statistic is 3.7065. The *p*-value is .156728. The result is *not* significant at $p < .05$.				

Table 1 shows the distribution of patient's as per the age and sex. In this table all 490 patients who attended the nephrology clinic are included. Out of these 499 only 466 were found to fit in the inclusion and exclusion criteria of our study.

Only 3 patients out of these 466 were under 20 years of age. Maximum patients ie 165 ere in the age group of 51-60 yrs and second highest were in 41-50 years age group. This table also compares males (55%) vs females (44%) and it was observed that more number of males as per females were suffering from kidney disease.

Table 2 shows the statistical comparison of males and females with in the groups in CKD patients. It was observed that the males suffered from CKD more statistically as compared to females in all the three groups.

Table 3 shows the statistical comparison of males and females with in the groups in ESRD patients. It was observed that the difference is not statistically significant suggesting that the progression of disease is not related to the sex of the patient. Once the disease is set in its progression is independent of the sex of patient.

Table 4 shows relationship of groups with the progression of CKD to ESRD. It was observed that there was no statistically significant difference in the groups when they were tested for the progression of the disease from CKD to ESRD suggesting that the progression of CKD to ESRD does not depend upon the number of comorbidities involved.

Discussion

It is a well-known fact that the progression of CKD to end stage renal disease is inevitable although the treatment can delay this. The patient suffering from diabetes, chronic Glomerulonephritis, Polycystic kidney disease, renal amyloidosis and chronic tubulo-interstitial disease are the one those who most commonly advances from CKD to ESRD, also the role of hypertension in this progression cannot be underestimated. It is a fact that patients will Sooner or later will need renal transplant which in itself adds to the treatment cost immensely. To stop or delay the progression of CKD into ESRD targeted blood pressure control and blood sugar control is of main importance.

The aim of our study was to observe the prognosis of CKD in patients suffering from hypertension, Diabetes mellitus or both. This will help in contributing early identification of the subgroup of patients at high risk for ESRD and thus resulting in early intervention causing a significant delay in the progression of disease.

In our study we observed that males have more predilections towards the CKD as compared to females. Our results were in accordance with Carrero JJ et al[8] and Sabolic I[9] et al, they also in separate studies found that CKD progression may depend upon the sex of patient and male patients show substantially higher prevalence of CKD as compared to female patients. In another study conducted in Japan by Iseki ke[10] shows that men with diabetes have higher risk of CKD as compared to females. However in our study

this difference faded when the patients progressed into ESRD. In our study we observed that there was no significant difference in the progression of the disease when it was tested against the sex of the patient suggesting that the progression of the disease is independent of the sex of the patient. Our results are not in accordance with the studies conducted by Carrero JJ et al[8], Sabolic I[9] and Iseki ke[10] but in a study conducted by Jaffer TH et al[11]. The difference in renal disease progression was not significantly related to the sex of patient when the baseline proteinuria mean, arterial pressure and high density lipoprotein levels were adjusted.

We did not found any significant difference in three groups for the progression of the disease from CKD to ESRD. Although the group with both hypertension and diabetes mellitus did show significant difference in progression of the disease from CKD to ESRD (p value less than 0.05) suggesting that if the number of comorbidities is more, the progression of disease shows faster rate, hence these are the group of patients which should be considered as highest risk group and should be more frequently monitored, although this depends on many other factors like controlled or uncontrolled status of disease, patient compliance towards the treatment etc, this may explain our statistically non- significant result. But when the percentage calculation was compared this group closely followed HTN group.

It is observed that CKD and HTN are quite closely associated and have amalgamated cause and effect relationship. The long term elevation of BP results in faster progression of the Kidney Disease[12]. In our study also we observed that the significant number of patients of this group progressed towards ESRD. Both the CKD and HTN are bind in a vicious circle, it is observed that reduction in kidney function leads to the elevation of BP and elevated BP leads to decline in kidney function, with advancing CKD the control of HTN becomes more and more difficult, hence the management of HTN plays a crucial role in decreasing the rate of progression of CKD. Just like HTN DM also finds itself in similar relationship with CKD. It is a known fact that DM is a major risk factor for renal failure and renal failure leads to uncontrolled diabetes and increased need for insulin, this is usually observed due to due to metabolic acidosis, elevated levels of parathyroid hormone, and decreased level of vitamin D in CKD[13,14]. Similarly in our study also we observed that a significant number of patients of diabetic group progressed towards ESRD.

Our results conclude that thee was no significant difference in the three groups when compared statistically but the percentage progression of HTN group towards ESRD was highest among the three groups, followed by DM+HTN and the lastly it was DM. this result suggests the significant role of HTN plays in progression of CKD. We also observed all the three groups significantly progressed towards the ESRD, suggesting that the control of DM and HTN is crucial for the delay in progression of CKD.

Conclusion

CKD – **C**hronic **K**idney **D**isease is now a day perceived as **C**ardio **K**idney **D**amage, emphasising the role of cardiovascular diseases play in the progression of this disease.

DM and HTN are considered as major risk factors for CKD. Both DM and HTN are intermingled within cause and effect relationship with CKD. The progression of CKD to ESSRD increases the mortality and morbidity and it also adds to the financial burden of the disease. Till date the researchers were concentrating on either of them separately, but there is a large group of patients which suffers from both of these conditions and thus we conducted our study to observe and compare the progression of CKD to ESRD in the group suffering from both DM and HTN.

We did not found any significant difference in the progression rate of all the three groups but our results emphasise that the percentage population suffering from HTN and HTN +DM did progress more towards ESRD.

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Source of Support:Nil
Conflict of Interest: Nil