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# Prevalence of Hypertension and Diabetes in Chronic Kidney Disease: A Tertiary Care Hospital Based Cross-sectional Study in Mymensingh, Bangladesh

*TB Tousuf[1], SAA Towhid[2], SMMA Tanzim[3], MF Proteek[4], MA Hasanat[5]

**Abstract**

**Background:** Chronic kidney disease (CKD) is a worldwide public health problem. It is usually associated with hypertension (HTN) and diabetes mellitus (DM) and the prevalence of these complications increases progressively with worsening CKD. **Objective:** To find out the association of HTN and DM with different stages of CKD. **Methods:** This cross-sectional study was conducted at the Department of Physiology, Mymensingh Medical College, Bangladesh, for one year from January to December 2016. A total number of 73 diagnosed CKD patients and 73 non-CKD individuals were enrolled in the study. Blood pressure was measured by using a sphygmomanometer and stethoscope. Serum glucose concentrations were measured by using an auto-analyzer. **Results:** Hypertension and diabetes were more prevalent in CKD than in non-CKD individuals, which were statistically significant. Among 73 CKD patients, 42.5% were diagnosed as hypertensive, and 34.3% were diagnosed as diabetic. **Conclusion:** This study revealed that the prevalence of HTN and DM is common in all stages of CKD patients in Mymensingh, Bangladesh. It emphasizes the need for regular checking of blood pressure, blood glucose, serum creatinine and estimated glomerular filtration rate (eGFR) level in CKD patients and early referral to nephrologists.

**Keywords:** Hypertension, Diabetes mellitus, Chronic kidney disease, eGFR

## Introduction

Chronic kidney disease (CKD) became an epidemic in the twentieth and twenty-first centuries and it is a global problem, mainly due to different risk factors being involved in its etiology and pathophysiology. It is a major public health problem with poor outcomes and it reduces lifespan significantly.[1,2] Individuals with CKD have an increased risk of cardiovascular disease and may develop end-stage renal disease (ESRD).[3,4] CKD is defined as either decreased glomerular filtration rate (GFR) or albuminuria or both.[5]

Hypertension and diabetes mellitus (DM) are two major causes of chronic kidney disease nowadays in the world.[6,7] Hypertension and both type 1 and type 2 diabetes mellitus are frequent comorbid conditions in CKD affecting most of the patients at the time of diagnosis.[8]

1. Dr. Talha Bin Yousuf, Assistant Professor, Department of Physiology, North Bengal Medical College, Sirajganj, Bangladesh. Email: talhaysf@gmail.com
2. Dr. Shah Abdullah Al Towhid, Lecturer, Department of Physiology, Sylhet MAG Osmani Medical College, Sylhet, Bangladesh.
3. Dr. S.M. Maruf-Al-Tanzim, Lecturer, Department of Pathology, Mymensingh Medical College, Mymensingh, Bangladesh.
4. Dr. Mehdi Faruk Proteek, Specialist, Medical Oncology, Evercare Hospital, Dhaka.
5. Dr. Md. Abul Hasanat, Associate Professor & Head, Department of Physiology, Gazi Medical College, Khulna.

CKD and hypertension (HTN) are closely associated with an overlapping and intermingled cause-and-effect relationship. Declines in kidney function are typically associated with rises in blood pressure (BP) and sustained elevations in BP hasten the progression of kidney dysfunction.[9]

It is not surprising that diabetic nephropathy is one of the leading causes of end-stage renal failure and HTN is both an important cause and consequence of chronic kidney disease. [10,11]

Although many studies have been done on the prevalence of diabetes and hypertension in CKD in various geographical regions, very few works have been executed in Bangladesh, to the best of our knowledge.

Therefore, the purpose of this study was to evaluate the prevalence of DM and HTN in CKD. Our goal was to develop a better understanding of the prevalence of these diseases and to understand the contributing factors so that we can develop effective strategies to blunt the long-term health consequences for these areas with limited healthcare resources.

## Materials and methods

This cross-sectional study was conducted in the Department of Physiology in Mymensingh Medical College from January to December, 2016. One hundred forty-six individuals participated in the study; among them were 73 CKD patients and 73 were non-CKD individuals. During the visit, every participant was interviewed and examined and samples of blood were collected with informed written consent. The patients were selected based on history, clinical examination and relevant investigations. Serum glucose was determined by using an auto analyzer. Persons below 20 years and above 70 years, pregnant women, patients with arthritis, chronic liver disease, alcoholics, endocrine disorders, and malignancy were excluded from our study. Fasting serum glucose of more than 7 mmol/l and 2 hours after breakfast serum glucose of more than 11.1 mmol/l was diagnosed as diabetic. Stages of CKD were determined by calculating estimated GFR. Statistical analysis was done by using SPSS, version 20, and the level of significance was determined by the student's unpaired t-test.

## Results

Among one hundred forty-six participants 73 were CKD patients and 73 were non-CKD individuals. In the CKD group, 41 were male and 32 were female. Of the 73 CKD patients, 31 were diagnosed as hypertensive and 25 were diagnosed as diabetic.

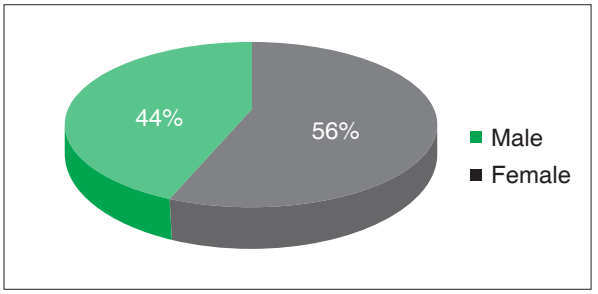


**Figure 01: Distribution of CKD patients according to gender**

**Table 01: Frequency of DM and HTN in CKD (n=73)**

| Disease | Frequency | Percentage |
|---|---|---|
| HTN | 31 | 42.5% |
| DM | 25 | 34.2% |

Diabetes was diagnosed by measuring fasting and 2 hours after meal glucose test. Though, serum glucose found in the range of diabetes was less, many of them were found in the range of prediabetes.

**Table 02: Frequency of diabetic, prediabetic and non-diabetic subjects in CKD group**

| Diabetes status | Numbers | Percentage (%) |
|---|---|---|
| Diabetic | 25 | 34 |
| Prediabetic | 27 | 37 |
| Nondiabetic | 21 | 29 |

**Table 03: Comparison of HTN between CKD and non-CKD group**

| Parameters | CKD | Non-CKD | Chi-square value | P-value |
|---|---|---|---|---|
| HTN | 31 | 6 | 22.63 | .00001[s] |
| Non-HTN | 42 | 67 | | |

s=significant

**Table 04: Comparison of DM between CKD and non-CKD group**

| Parameters | CKD | Non-CKD | Chi-square value | P-value |
|---|---|---|---|---|
| DM | 25 | 8 | 11.32 | .0007[s] |
| Non-DM | 48 | 65 | | |

s=significant

**Table 05: Percentage of hypertension and diabetes according to CKD stages**

| CKD stages | Hypertension (n=31) | Percentage (%) | Diabetes (n=25) | Percentage (%) |
|---|---|---|---|---|
| 1 | 5 | 16.1 | 3 | 12 |
| 2 | 7 | 22.5 | 6 | 24 |
| 3 | 11 | 35.5 | 9 | 36 |
| 4 | 6 | 19.4 | 5 | 20 |
| 5 | 2 | 6.5 | 2 | 8 |

## Discussion

Chronic kidney disease (CKD) is a common disorder and an important rising public health problem worldwide. Various factors cause this increase, including the growing prevalence of diabetes and hypertension. Moreover, comorbidity of hypertension and diabetes produces an increased risk of many complications.[12-14]

In our study, we have found an association between diabetes and hypertension with CKD. The prevalence of hypertension is more than diabetes, where 42.5% were hypertensive and 32.4% were diabetic. Other studies done by some researcher also shows a similar result to ours.

In a community-based cohort study, it was found that blood pressure is significantly higher in patients with mild renal failure (serum creatinine>1.5 mg/dl) than in those with normal renal function.[15]

A similar result was found in a study where patients with moderate to severe renal disease had a very high incidence of hypertension. Evidence presented that, in ESRD, hypertension results from extracellular volume expansion, the increased or inappropriate response of the renin-angiotensin system and overactivity of the sympathetic system. In addition, the role of endothelin-1, abnormal ion channels, nitric oxide and other vasodilators are also important in generating high blood pressure.[16]

The kidneys play such a vital role in long-term blood pressure regulation that Guyton argued that sustained hypertension could not occur in the

absence of impairment of renal handling of sodium.[17]

The relation between hypertension and kidney disease sometimes propagates a vicious cycle where primary kidney damage leads to elevated blood pressure that causes more damage to the kidneys and more increases in blood pressure, finally developing end-stage renal disease.[18]

Hypertension is caused by a diseased kidney due to the patchy ischemic kidney tissue secreting renin, and this, in turn, acting through the formation of angiotensin II, causes the remaining kidney mass also to retain salt and water.[19]

In a cross-sectional study done by Roberto M et al. in Italy, it was found that high blood sugar (diabetes) is more in CKD patients.[20] In a community-based cohort study, it was found that blood sugar was significantly higher in patients with mild renal failure than in those with normal renal function.[15]

A possible mechanism of hyperglycemia in CKD is that, as the glomerular filtration decreases below 50 ml/min, insulin secretion also decreases due to the presence of metabolic acidosis, and increased parathyroid hormone; so insulin can not decrease blood glucose level.[21]

Patients with renal failure have impaired insulin sensitivity with consequent abnormal glucose metabolism, an increase of gluconeogenesis in the liver, reduction of hepatic and skeletal muscle glucose uptake, and an impairment of the intracellular glucose metabolism and diminished glycogen synthesis may be involved to cause hyperglycemia.[21-23]

## Conclusion

Our study shows that diabetes and hypertension are more prevalent in CKD patients. On the ground of our study, we understood that much effort should be given to increase the awareness of the community people and the physicians in the primary care of diabetic and hypertensive patients who have a greater possibility to develop CKD. This could be done by regular checking of blood pressure, serum glucose, and serum creatinine and calculating the estimated GFR of these high-risk group people and an early referral to nephrologists.

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