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Chronic Kidney Disease and Associated Risk Factors Assessment among Diabetes Mellitus Patients at Swastika Diagnostic Laboratory

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Abstract: ***The prevalence of chronic kidney disease, particularly in diabetic patients, is increasing rapidly throughout the world. Nowadays, many individuals in developing nations are suffering from diabetes which is one of the primary risk factors of chronic kidney disease. Institution based cross - sectional study was conducted at the Swastika Diagnostic Laboratory, Jammu. A total of 135 study participants were selected using systematic random sampling technique. Urine sample was collected for albumin determination by dipstick. The Simplified Modification of Diet in Renal Disease study equation was used to estimate glomerular filtration rate. Binary logistic regression model was used to identify risk factors.***

Keywords: Chronic kidney disease, Diabetes mellitus, Glomerular filtration rate, Risk factors

1. Introduction

Chronic kidney disease (CKD) is a progressive loss in renal function over a period of three months or years. Kidneys can get damaged from a physical injury or a disease like diabetes mellitus (DM) or high blood pressure. Once kidneys are damaged, they cannot filter blood or perform other activities. This is usually associated with a reduction in glomerular filtration rate (GFR) and proteinuria (1, 2). CKD is a worldwide public health problem, both for the number of patients and cost of treatment involved. It was a cause of 409, 000 and 956, 000 deaths in 1990 and 2013, respectively. Of those deaths, 46, 000 (1990) and 173, 000 (2013) were caused by CKD due to DM (3). Globally, diseases of the kidney and urinary tract together are the 12th cause of death and the 17th cause of disability (4). CKD affects around 10 13% of the general population (5). It has been estimated that more than 500 million individuals globally have CKD, regardless of the cause (6). In sub - Saharan Africa, CKD is a considerable health burden. CKD is at least 3 4 times more frequent in Africa than in developed world (7). CKD is associated with adverse outcomes of kidney failure, cardiovascular disease (CVD), and premature death (5, 8). The risk of cardiovascular mortality, kidney failure, kidney - disease progression, acute kidney injury, cognitive decline, anemia, mineral and bone disorders, fractures and hospitalizations are higher among patients with CKD than those with normal renal function (9, 10). Many of the complications of CKD can be prevented or delayed by early detection and treatment (11). major risk factors for the development and progression of CKD are diabetes and hypertension. CKD due to diabetes and hypertension affects nearly 5 7% of the world population and is more common in developing countries and disadvantaged and minority populations. Each kidney is made up of millions of tiny filters called nephrons. Over time, high blood sugar from diabetes can damage blood vessels in the kidneys as well as nephron should be with diabetic develop with high blood pressure, which can damage kidneys too. (12). Diabetes causes 9.1 29.9% of the cases of end stage renal disease (ESRD) in various developing countries, and hypertension leads to 13 21% of the cases (13). Hypertension affects almost 25% of the adult population in Africa and is the cause of chronic kidney failure in 21% of patients on renal replacement therapy in South Africa. The prevalence of diabetic nephropathy is estimated to be 23.8% in Zambia, 14% - 16% in South Africa, 12.4% in Egypt, 9% in Sudan, and 6.1% in Ethiopia (7).

CKD is an important cause of death and disability worldwide, but awareness of the disorder remains low in many communities and among many healthcare providers (10). The prevalence of DM is increasing alarmingly in developing countries like India (14). In parallel, CKD will increase even if studies did not show the exact magnitude particularly in the study area. Hypertension, a global public health problem, is currently the leading factor in the global burden of disease. It is the major modifiable risk factor for heart disease, stroke and kidney failure. Chronic kidney disease (CKD) is both a common cause of hypertension and CKD is also a complication of uncontrolled hypertension. The interaction between hypertension and CKD is complex and increases the risk of adverse cardiovascular and cerebrovascular outcomes. This is particularly significant in the setting of resistant hypertension commonly seen in patient with CKD. The pathophysiology of CKD associated hypertension is multi - factorial with different mechanisms contributing to hypertension. These pathogenic mechanisms include sodium dysregulation, increased sympathetic nervous system and alterations in renin angiotensin aldosterone system activity. Standardized blood pressure (BP) measurement is essential in establishing the diagnosis and management of hypertension in CKD. Use of ambulatory blood pressure monitoring provides an additional assessment of diurnal variation in BP commonly seen in CKD patients. (59) The optimal BP target in the treatment of hypertension in general and CKD population remains a matter of debate and controversial despite recent guidelines and clinical trial data. Medical therapy of patients with CKD associated hypertension can be difficult and challenging. Additional evaluation by a hypertension specialist may be required in the setting of treatment resistant hypertension by excluding pseudo - resistance and

treatable secondary causes. Treatment with a combination of antihypertensive drugs, including appropriate diuretic choice, based on estimated glomerular filtration rate, is a key component of hypertension management in CKD patients. In addition to drug treatment non - pharmacological approaches including life style modification, most important of which is dietary salt restriction, should be included in the management of hypertension in CKD patients**.**

2. Materials and Methods

The study was conducted at Swastika Diagnostic laboratory, Jammu. Adult DM patients who volunteered to give informed written consent were included in the study. Pregnant, hospitalized, non - fasting, febrile patients and patients with HIV and CVD were excluded. Institution based cross - sectional study.

Data Collection

185 study participants were assumed to be included, only 135 volunteered to give informed written consent to participate in the study. Study participants were selected by systematic random sampling technique. Laboratory technologists collected blood and urine samples, and performed biochemical tests. Five milliliters of fasting venous blood sample was collected with standard venipuncture technique to separate serum. Mindray BS - 200 analyzer was used for biochemical analysis. Serum glucose, creatinine and urea level were measured using the enzymatic glucose oxidase, kinetic alkaline picrate and enzymatic glutamate - dehydrogenase (GLDH) methods, respectively. Ten milliliters of freshly voided urine was collected by clean and dry container. Then, urine albumin was determined by using dipsticks (COMBINA 11S, Human). Presence of albumin in the urine (from +1 to +4) was defined as albuminuria. The glomerular filtration rate (GFR) was estimated using Modification of Diet in Renal Disease (MDRD) study equat Equation as follows:

186× [serum if female) x (1.212, if black) (17)

CKD was defined incorporating both eGFR and albuminuria. Patients having CKD were classified into five stages according to the Kidney Disease: Improving Global Outcomes (KDIGO) classification system as follows:
Stage 1: albuminuria >90 with eGFR of ml/min/1.73 m2,
Stage 2: albuminuria with eGFR of 60 89 ml/min/1.73 m2,
Stage 3: eGFR of 30 59 ml/min/1.73 m2, stage 4: eGFR of 15 29 ml/min/1.73 m2
Stage 3 was further classified into 3A (eGFR of 45 59.9 ml/min/1.73 m2) and 3B (eGFR of
3044.9ml/min/1.73 m2).
Stage 5 (kidney failure): eGFR of <15ml/min/1.73 m2

3. Results

Of the total 135 study participants, 50.2% were females and the mean age was 47±15.7 years. Among study participants, the prevalence of chronic kidney disease (CKD) was found to be 21.8% (95% CI: 16% 27%). Of all study participants, 9 (3.9%) had renal impairment (eGFR < 60 ml/min/ 1.73 m2) and 46 (20.1%) had albuminuria. Older age (AOR: 5.239, 95% CI: 2.235 3.633, 95% CI: 1.597 8.265), type 2 diabetes mellitus (AOR: 3.751, 95% CI: 1.507 9.336) and longer duration of diabetes (AOR: 3.380, 95% CI: 1.393 8.197) were independent
risk factors of CKD.

4. Conclusion

The study identified high prevalence (21.8%) of CKD among diabetic adults. CKD was significantly associated with older age, systolic blood pressure, type 2 DM and longer duration of DM. Thus, DM patients should be diagnosed for chronic kidney disease and then managed accordingly.

5. Discussion

This study has assessed the prevalence and risk factors of CKD among diabetic adults using an estimated glomerular filtration rate (eGFR) and urine albumin according to KDIGO guideline The prevalence of CKD was 21.8% (95% CI: 16% 27%). Of all our study participants, 9 (3.9%) had renal impairment (eGFR < 60 mL/min/1.73m2) and 46 (20.1%) had albuminuria (Table 2). All of the participants who had renal impairment and of the with albuminuria (37/46, 80%) were type 2 DM patients. Nine (3.9%), 32 (14.0%), 8 (3.5%), and 1 (0.4%) DM patients had an estimated GFR of ml/min/1.73m2 (stage 1), 60 89.9 ml/min/1.73m2 (stage 2), 30 59.9 ml/min/1.73m2 (stage 3) and <15 ml/min/1.73 m2 (stage 5), respectively (Table 3). Our estimate prevalence of CKD was lower than reports from Spain (27.9%) (18), Netherlands (28%) (19), UK (31%) (20), Mediterranean area (34.1%) (21), USA (39.6%) (22) and Japan (42.3%) (23). This difference in CKD prevalence might be because of the differences in case - mix (some of the studies included both type 1 and type 2 DM patients but others included only type 2 DM patients), creatinine and albumin assays, sample size and ethnic variations. CKD was independently associated with type 2 DM (AOR: 3.751, 95% CI: 1.507 9.336) and longer duration of DM (AOR: 3.380, 95% CI: 1.393 8.197) in our study subjects. This corresponds with the findings of several studies which reported that the likelihood of developing CKD was greater among patients with longer duration of diabetes (24, 30, 31). CKD is estimated to affect 50% patients with type 2 DM. Improvement in cardiovascular survival in patient with type 2 DM has contributed to patient surviving longer, allowing sufficienttime to develop renal disease (32). However, CKD was not independently associated with type 2 DM in Japanese study (23)

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