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Original Article

Uncontrolled Diabetes is a Risk Factor for Chronic Kidney Disease in Tsawa City Southern Libya

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ABSTRACT

Purpose: Long-term uncontrolled diabetes can cause a deterioration in the kidney function. The diabetes is the most frequent cause of chronic kidney disease (CKD) in most countries. In previous study in Libya as a cause of CKD in (49%) of study sample. for this reason, we investigated and collected data from the Tsawa city southern Libya to determine the relationship between uncontrolled diabetes and the CKD.

Methods: In this cross-sectional study, data was collected from 303 adults visiting Tsawa Hospital from July 2023 to august 2023. Biochemical parameters, including random blood sugar, HA1C, kidney function tests (urea, creatinine) and urine. Statistical analysis using SPSS version 21 program to calculate correlation between analysis values.

Results: There is a significant correlation between blood glucose levels and kidney dysfunction was observed ($p < 0.05$), ($p< 0.01$) The study revealed that 31% of the 303 participants examined had high random blood sugar levels. Among these cases, 57% (**$p< 0.01$) had elevated urea levels. 71 % of the cases showed elevated HbA1c levels which suggests that individuals with poorly controlled blood sugar over time. The study found that 8% diabetic patients (*$p < 0.05$) had elevated creatinine levels. 53% of patients (**$p< 0.01$) showing proteinuria which is a crucial indicator of kidney damage, and its presence in over half of the diabetic patients in this study indicates that a significant proportion of individuals with diabetes are at risk of developing more severe kidney damage.

Conclusions: Uncontrolled long standing Diabetes considered as a risk factor for Chronic Kidney Disease, so, comprehensive diabetes management and regular monitoring of the kidney functions in diabetics are vital components to prevent or delay the onset of chronic kidney disease.

Keywords: Diabetes, chronic kidney disease, Tsawa, Libya.

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INTRODUCTION

Diabetes mellitus is a metabolic homeostasis disorder controlled by insulin, resulting in abnormalities of carbohydrate and lipid metabolism. Type 1 diabetes (insulin-dependent diabetes mellitus) is caused by an absolute insulin deficiency, the result of a loss of the insulin-producing beta cells of the pancreas. Type 2 diabetes mellitus is characterized by two underlying defects. insulin resistance is The earliest abnormality in an individual who develops type 2 diabetes mellitus , which initially is compensated with an increase in insulin secretion The World Health Organization was estimated that 3% of the world's population (194 million) have diabetes and the prevalence is expected to double by the year 2025 to 6.3%.[1] In Libya were 300,000 diabetics estimated by WHO in year 2006. This prevalence is estimated to rise in 2030. According to local epidemiological studies, the prevalence for known diabetic patients aged over 20 years was 3.8%

As 50% of type 2 diabetic patients are undiagnosed, the actual prevalence is probably higher.[2] Long-term elevation of blood sugar levels can damage the walls of the fine blood vessels in the renal corpuscles. Holes begin to form and the vascular walls become more permeable, causing more protein to be excreted via the urine. These diabetes-related changes cause a deterioration in blood circulation and kidney function. Medical specialists refer to this situation as renal insufficiency. The diabetes is The most frequent cause of end-stage renal disease (ESRD) in most countries. In 2009–2011, the diabetes was the primary cause of ESRD in about 60% of patients in Malaysia.[3] The diabetes may play a major role in kidney failure which reported in previous study in Libya as a cause of CKD in (49%) of study sample.4 For this reason we investigated and collected data from the tsawa city southern Libya to determine the relationship between uncontrolled diabetes and the elvation of CKD.

The actual prevalence is probably higher.[4] Urinary tract infection (UTIS) are prevlent bacterial infections impacting the urinary system, which includes the kidneys, bladder, and urethra. They are especially common in people with diabetes, who face a heightened risk for several infection, such as UTis. The connection between diabetes and UTis intricate, involving multiple factors that lead to increased vulnerability these factors encompass elenated blood glucose levels, modified immune reactions, and variations the urinary tract environment. Diabetes, particularly when not well managed, can result in hyperglycemia promoting bacterial proliferation and weakening immune response. Moreover, individuals with diabetes have a higher tendency to develop neuropathy, which can affect bladder function, resulting in incomplete bladder emptying, a situation that encourages bacterial proliferation. Moreover, diabetic nephropathy, a complication arising from diabetes may raise the risk of urinary tract infections because of kidney damage and reduced renal function. Research indicates that people with diabetes, especially those with inadequately managed blood glucose levels or a longer history of the disease, experience a greater frequency of diabetic people. UTis than non-The frequent occurrence of UTis in patients with diabetes presents difficulties, as it can result in complications like pyelonephritis,kidney damage, or sepsis if not properly addressed.[4]

Chronic kidney disease (CKD) is a common complication of diabetes, a global health concern that affects millions of individuals. Diabetes, particularly when poorly controlled, has been shown to contribute significantly to the development and progression of kidney dysfunction. The mechanisms behind this relationship include prolonged hyperglycemia, which leads to kidney damage over time. Studies have demonstrated that individuals with diabetes are at a higher risk of developing CKD, and the progression of kidney disease can be exacerbated by poor glycemic control and the presence of comorbidities.[5] This study aims to investigate the relationship between diabetes and chronic kidney disease, focusing on how glycemic control, duration of diabetes, and associated factors influence kidney function in outpatients among visitors to Tsawa Hospital.

MATERIALS AND METHODS

This study involved a cross-sectional analysis of data from 303 adults visiting Tsawa Hospital. Data were collected randomly from examinations of biochemical parameters, including Random blood sugar, HA1C, and kidney function tests (urea, creatinine and u.protein levels) For 303 patients . The analysis was done in the laboratories of the Tsawa Hospital, where samples of blood sugar and kidney function were collected from those coming to the hospital. They were analyzed in a chemistry device and the HA1C was analyzed in an I Chroma device, and the results were accurate. At Tsawa Hospital, biochemical tests were randomly and The patients were asked to participate in this study. Data collected continued from July 2023 to august 2023 then analyzed statistically using spss version 21 program to calculate correlation between analysis values.

RESULTS

The results of the study indicate a significant correlation between the duration of diabetes and the development of kidney dysfunction. A significant correlation between blood glucose levels and kidney dysfunction was observed ($p < 0.05$), ($p< 0.01$) suggesting that higher blood glucose levels are associated with more sever renal impairment.

Based on the data collected, several key findings emerged regarding the impact of diabetes on kidney function, which demonstrated a strong relationship between random blood sugar levels and markers of kidney dysfunction, including urea, creatinine, and protein levels. This suggests that higher random blood sugar levels could be indicative of impaired kidney function.

Urea levels showed the most significant impact in relation to elevated blood sugar levels. The study revealed that 31% of the 303participants examined had high random blood sugar levels. Among these cases, 57% (**$p< 0.01$) had elevated urea levels, indicating that high blood sugar may lead to an increase in urea levels in the blood. This could be a result of reduced kidney function (Figs 1, 2). 71% of the cases showed elevated HbA1c levels . HbA1c is a long-term marker of blood sugar levels and is often associated with a higher risk of complications such as kidney failure.

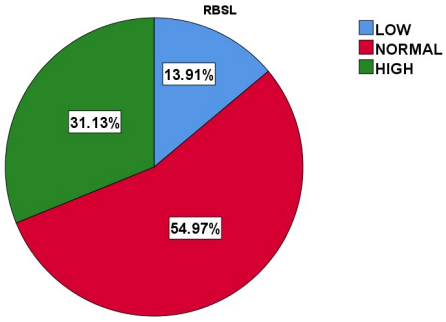

Fig 1. Percentage of random blood sugar level of outpatients visiting Tsawa hospital.

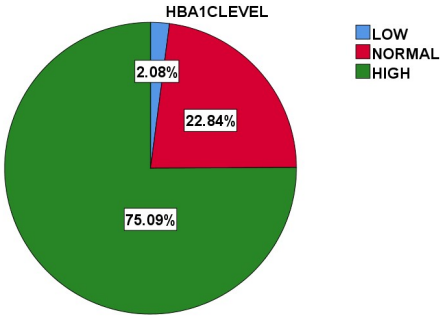

Fig 2. Percentage of HBA1C level of outpatients visiting Tsawa hospital.

The high percentage of elevated HbA1c in this study suggests that individuals with poorly controlled blood sugar over time are more likely to experience kidney dysfunction (Fig.3).

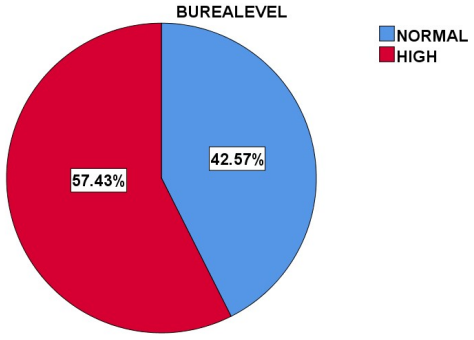

Fig 3. Percentage of Blood urea level of out patients visit Tsawa hospital.

The study found that 8% diabetic patients (*p < 0.05) had elevated creatinine levels, a critical marker of kidney function. Elevated creatinine levels indicate that the kidneys are not filtering waste products efficiently, which is a sign of impaired kidney function. 53% of patients (**p< 0.01) showing proteinuria reinforces the need for early detection of kidney dysfunction in diabetic patients. Proteinuria is a crucial indicator of kidney damage, and its presence in over half of the diabetic patients in this study indicates that a significant proportion of individuals with diabetes are at risk of developing more severe kidney damage (Fig.5).

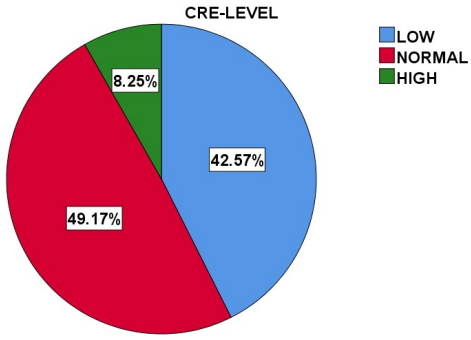

Fig 4. Percentage of Creatinine level of outpatients visit Tsawa hospital.

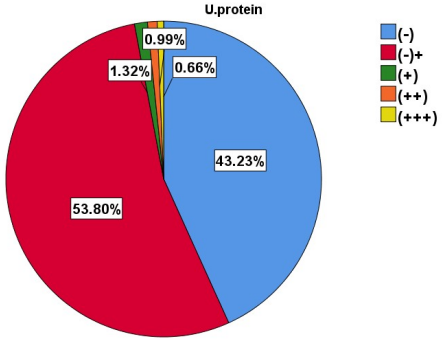

Fig 5. Percentage of Urine protein level of outpatients visiting Tsawa hospital.

DISCUSSION

Diabetes mellitus and it is relationship with CKD have been recognized as an important public health issue globally, More than 35% of people with diabetes have chronic kidney disease. In this study we collected random blood sample from patients visited Tsawa hospital to examine blood sugar parameters and renal function. (75.1%) of participants have high HBA1C level although not all participants were diagnosed as diabetic. 57.4% of patients had a high blood urea level. From our results the correlation between elevation of urea and HA1Clevel was statistically significant (p value 0.05), according to WHO report Over 29 million people in the United States have diabetes. Of these, 21.0 million are diagnosed and 8.1 million are undiagnosed. In 2013, diabetes led to more than 51,000 new cases of kidney failure and over 247,000 people are currently living with kidney failure resulting from diabetes. Our results showed that the percentage of people with high level of creatinine in the studied sample was about (8.25%), creatinine is a specific indicator of renal function. The correlation between increase creatinine level and high random blood sugar was statistically significant with (p value 0.05) similar results obtained from Previous study in the China in 2016 which reported that, almost 13.9% of diabetic patients had CKD.[6] Similar results from previous studies that established the relationship between diabetes and chronic kidney disease. Study in china found that CKD patients with diabetes had a 2.759 times increased risk (95% CI: 1.707-4.461) of progressing to dialysis, compared to those without diabetes.[7] Previous retrospective study conducted in 2023 on risk factors for chronic kidney disease (CKD), in patients from Southern Libya (Wadi Ataba) found that the highest risk factors for CKD were hypertension (HT) at 28.5%, followed by diabetes mellitus (DM) and hypertension combined at 16.1%, and diabetes at 36.1%.[8] These findings are similar to that of a large-scale population-based cohort study, which found that diabetic subjects reached kidney failure about twice as rapidly as non-diabetic subjects.[9] A global meta-analysis (including 28 cohorts; 185024 patients) also found that diabetes was a risk factor for all outcomes, such as KRT, CVD, and death.[10] Other previous studies have also proven that diabetes increases the risk of CKD progression to dialysis.[11] We found significant associations between higher levels of HbA1c and blood urea elevation, good glycemic control does help to prevent nephropathy and other microvascular complications of DM in healthy people.

CONCLUSION

The study underscores the importance of early detection and intervention in diabetic patients to protect kidney function. Tight control of blood sugar and regular monitoring of kidney markers are vital components of comprehensive diabetes management to prevent or delay the onset of chronic kidney disease. Further research is needed to explore more effective treatment strategies for protecting kidney health in diabetic individuals.

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