

Review Article



The Importance of UACR (Urinary Albumin Creatinine Ratio) Examination in Patients with Diabetes Mellitus Type 2: A Systematic Review

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ABSTRACT

Background: Diabetes mellitus is a chronic metabolic condition causing elevated blood glucose levels, leading to microvascular and macrovascular consequences. It is a leading cause of end-stage kidney disease (ESKD) and end-stage renal disease (ESRD). Diabetes causes diabetic nephropathy, which is the leading cause of end-stage renal disease. The urinary albumin-to-creatinine ratio (UACR) is a clinically used tool to evaluate albuminuria and prevent the progression of diabetic nephropathy. ACR measurements are predictive markers for renal outcomes, cardiovascular outcomes, and mortality in diabetics. Microalbuminuria, a condition characterized by 30 to 300 mg/g in spot urine, is an independent predictor of coronary artery disease, cardiovascular disease, and all-cause mortality. This systematic review aimed to understand the role of ACR (albumin creatinine ratio) urine in patients with type 2 diabetes mellitus based on the published article.

Method: The systematic review followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and used databases ScienceDirect, PubMed, and Sage Journal to search for articles on urinary albumin creatinine ratio in type 2 diabetes mellitus. The search used keyword, inclusion and exclusion criteria to screen the article. 10 articles met our criteria and were included in this research.

Results: ACR (albumin creatinine ratio) levels are linked to cardiovascular risk in patients with diabetes mellitus (DM), and high UACR (urinary albumin creatinine ratio) levels are linked to an increased risk of CKD (chronic kidney diseases). The patient's diabetes duration also impacts ACR levels. The KDI is a composite of eGFR (estimated glomerular filtration rate) and ACR risk variables with a clear linear relationship with all three outcomes. It may aid in the identification of high-risk individuals who will benefit the most from prophylactic medications.

Conclusion: Patients should be taught how better blood glucose and albuminuria control might help delay the progression of CKD. The male sex is protective; however, most female patients were postmenopausal with low estrogen levels, eliminating any potential renoprotective advantage. Dipsticks may be used for UACR testing, making it more convenient.

Keywords: DM 1; ESRD 2; ACR 3; diabetic nephropathy 4; UACR 5; Microalbuminuria 6



INTRODUCTION

Diabetes mellitus is a chronic metabolic condition that causes elevated blood glucose levels over time. This tissue damage can result in both microvascular and macrovascular consequences. Small blood vessels are damaged by microvascular problems, causing retinopathy, nephropathy, and neuropathy. Large blood arteries are damaged by macrovascular problems, which raises the risk of hypertension, heart attacks, strokes, decreased blood flow (particularly in the legs), and postponed wound healing.¹

Diabetes mellitus is becoming more common all over the world. According to the Diabetes Atlas 2021, People with diabetes mellitus worldwide reach more than 500 million. Meanwhile, in Indonesia, there are more than 19 million people with diabetes.² Diabetes mellitus is a leading cause of end-stage kidney disease (ESKD). Many multiethnic studies have found a higher prevalence of kidney problems in Asian individuals with type 2 diabetes mellitus.³ Patients with type 2 diabetes (T2D) are more likely to be diagnosed with end-stage renal disease (ESRD). Diabetes causes diabetic nephropathy, which is the leading cause of end-stage renal disease.⁴ Microvascular complications caused by chronic hyperglycemia are the leading cause of diabetes mellitus. Albumin excretion of more than 30 mg per day is known as microalbuminuria, which plays a vital role in the onset of diabetic nephropathy, which uncontrollably develops into clinical proteinuria and ends with a decrease in glomerular filtration rate and kidney failure.⁵

One of the most common complications of diabetes is diabetic nephropathy. While metabolic syndrome is an established risk factor for albuminuria and cardiovascular disease, it certainly is not the only risk factor. Furthermore, in prediabetes patients, a high glomerular filtration rate is related to impaired arterial stiffness and cardiovascular disease. The urinary albumin-to-creatinine ratio (ACR) is used clinically to evaluate albuminuria while also serving as a regular practice for diabetes management and intervention to detect and prevent the progression of diabetic nephropathy. Albuminuria is a warning sign of diabetes and shows the existence of diabetic microvascular damage. Previous research has shown that ACR is independently related to all-cause and cardiovascular disease mortality in diabetics.⁶ The detection of UACR (urinary albumin creatinine ratio) in diabetic individuals is a standard approach for clinical screening of kidney damage in these patients.⁷ Albumin-to-creatinine ratio (ACR) measurements of albuminuria are common in diabetics and are recognized as predictive markers for renal outcomes, cardiovascular outcomes, and mortality.⁸

The average concentration of UACR in spot urine samples is less than 30 mg/g. Men's average UACR values range from less than or equal to 17 mg/g, but women's levels are often higher, about 25 mg/g. Microalbuminuria occurs when the spot pee contains 30 to 300 mg/g. In the general population, microalbuminuria is an independent predictor of coronary artery disease, cardiovascular disease, and all-cause mortality. There is conflicting evidence from several observational studies that there is a link between incident hypertension and a slight increase in UACR within the normal range.⁹ A systematic review is done to determine the role of ACR urine in patients with DM type 2.

METHOD

The systematic review followed recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The research articles used in this systematic review were obtained from some databases such as ScienceDirect, PubMed and Sage. The search used keywords: 'urinary albumin creatinine ratio in type 2 diabetes mellitus'. The next stage was analysis and synthesis, in which the article adjusted to the inclusion and exclusion criteria previously defined. Criteria for Inclusion in this systematic review are (1) an article in English, (2) free full text, (3) discuss diabetes mellitus type 2, (4) published from 2018 to May 2023, and (5) based on experiment or research data. Exclusion criteria for a systematic review are (1) full text not available, (2) the title of the article needs to be more relevant to the topic (3) it does not discuss the role of ACR Urine.

RESULTS

The search process conducted is described in Figure 1. Based on the search results from several databases using predefined keywords, in total 22,629 articles were obtained. After the screening according to our criteria, 10 articles were met the criteria and included to the analysis.

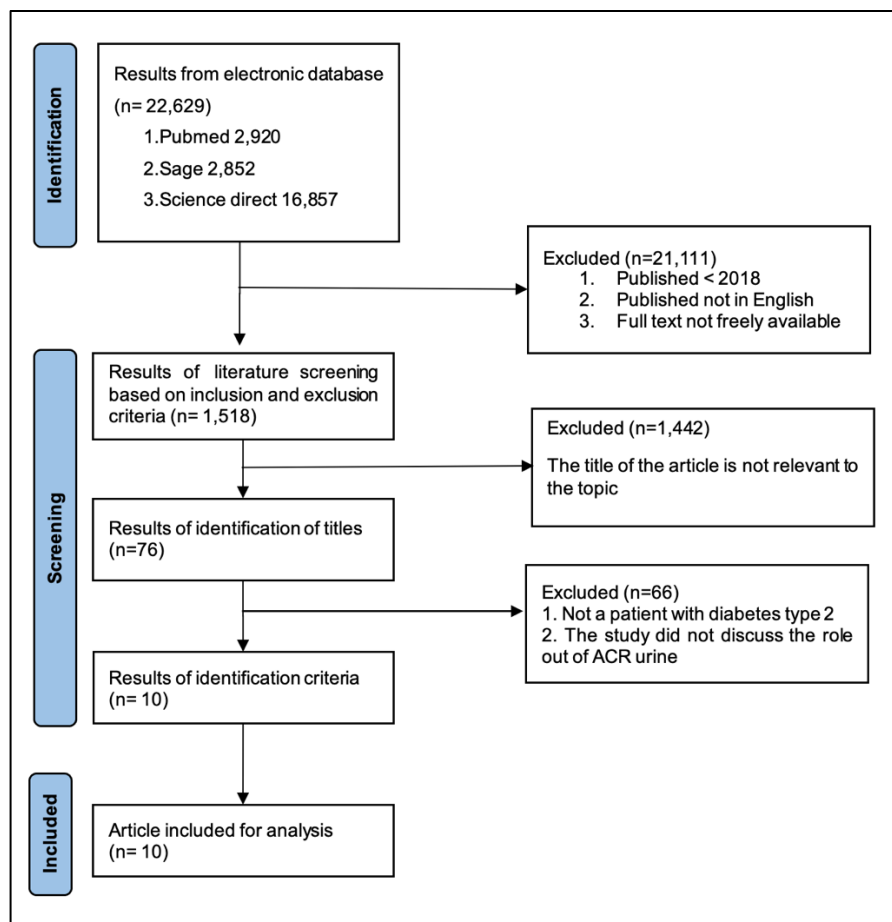


Figure 1. Diagram of Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA)

Ten articles were included in the analysis, we synthesized each article by looking at the design, sample, variables, instruments and analysis used (Table 1)

Table 1. Summary of findings from articles included

NO	Author	Year	Title	Methods (design, samples, variables, instrument, analysis)		Results
1	Hertzel C. Gerstein <i>et al.</i>	2022	A novel kidney disease index reflecting both the albumin-to-creatinine ratio and estimated glomerular filtration rate predicted cardiovascular and kidney outcomes in type 2 diabetes. ⁸	D	comparative design study	The kidney disease index combines the baseline eGFR and ACR into a novel composite risk factor that has a simple linear relationship with incident serious outcomes in people with diabetes and additional cardiovascular risk factors.
				S	purposive sampling;	
				V	people aged 50 or older with either newly diagnosed or established type 2 diabetes whose body mass index was ≥ 23 kg/m ² and whose HbA1c was 9.5% or less (with no lower limit) on stable doses of up to 2 oral glucose-lowering drugs with or without basal insulin between August 2011 and 2013	
				I	Annual laboratory assessments (measured urine albumin-to-creatinine ratio (ACR) and estimated glomerular filtration rate	
				A	Chi-square	
2	Wilailuck Tuntayothin <i>et al.</i>	2020	Development and Validation of a Chronic Kidney Disease Prediction Model for Type 2 Diabetes Mellitus in Thailand. ¹⁰	D	retrospective cohort study	Older age, female sex, lower eGFR, higher UACR, and higher HbA1c were associated with an increased risk of developing stage-3 CKD in Thai patients with type 2 DM. Higher UACR at baseline reflects preexisting kidney damage.
				S	purposive sampling;	
				V	V = patients with type 2 DM treated at the Diabetics Clinic Centre at Taksin Hospital in Bangkok, Thailand	
				I	medical record	
				A	Baseline characteristics of training and validation data sets were compared using Student's t-test or Mann-Whitney. Wilcoxon test for continuous variables and chi-square test for categorical variables	
3	Austin G. Stack <i>et al.</i>	2021	Effect of Intensive Urate Lowering with Combined	D	multicenter, prospective, randomized, double-blinded, parallel-group, placebo-controlled trial	The study met the primary objective with a reduction in UACR from baseline at 12
				S	purposive sampling;	

NO	Author	Year	Title	Methods (design, samples, variables, instrument, analysis)		Results
			Verinurad and Febuxostat on Albuminuria in Patients With Type 2 Diabetes: A Randomized Trial. ¹¹	V	Adults 18 years or older with T2DM	weeks for verinurad plus febuxostat versus placebo
		I		medical record		
		A		Standard descriptive statistics		
4	Yuxian Xie <i>et al.</i>	2022	Assessment of urinary podocalyxin as an alternative marker for urinary albumin creatinine ratio in the early stage of diabetic kidney disease in older patients. ¹²	D	correlational studies	The correlation coefficient between PCX (Podocaxin) and ACR (albumin creatinine ratio) is 0.852. Based on the ROC curve analysis, PCX's area under the ROC (receiving operator characteristic) curve is 0.946; the cutoff is 3.09. Finally, the sensitivity and specificity are 0.84 and 0.91, respectively. 132 cases of DKD (diabetic kidney disease) diagnosed with ACR; among them, PCX predicted 104 cases of DKD. The percentage correction value was 78.8%
				S	purposive sampling;	
				V	type 2 DM with no history of diabetic kidney diseases	
				I	medical record	
				A	Kruskal–Wallis, one-way anova and spearman test	
5	Natalia Nowak <i>et al.</i>	2018	Markers of early progressive renal decline in type 2 diabetes suggest different implications for etiological studies and prognostic test development. ¹³	D	comparative study	ACR remained independently associated with an increased risk of the development of early renal decline.
				S	purposive sampling;	
				V	1368 patients with T2D attending the Joslin Clinic between 2003 and 2009	
				I	medical record	
				A	Wilcoxon rank and regression linear	
6	Takaya Sasaki <i>et al.</i>	2021	Pathologic Diabetic	D	longitudinal study	The frequency of the duration of
				S	purposive sampling;	

NO	Author	Year	Title	Methods (design, samples, variables, instrument, analysis)		Results
			Nephropathy in Autopsied Diabetic Cases with Normo albuminuria From a Japanese Community-Based Study. ¹⁴	V	used autopsy specimens obtained from deceased people in the town of Hisayama from July 2002 to November 2017	diabetes mellitus is >5 years, increasing UACR (Urinary albumin-creatinine ratio) levels. Diabetic cases with class IIa or higher glomerular DN (diabetic nephropathy) lesions increased significantly with increasing UACR levels
		I		data autopsy		
		A		linear regression analysis		
7	Ze Wang <i>et al.</i>	2023	The positive association between urinary albumin-creatinine ratio and lower extremity peripheral arterial disease in Chinese diabetes patients: A cross-section study with propensity score matching analysis. ⁶	D	cross-sectional study	Elevated urinary ACR level was associated with decreased ABI (ankle-brachial index) in patients with diabetes. Therefore, elevated urinary ACR was associated with PAD (peripheral arterial disease) in Chinese patients with diabetes.
				S	purposive sampling;	
				V	Patients were diagnosed with diabetes according to the World Health Organization criteria defined over 18 years.	
				I	laboratory data	
				A	Fisher's exact tests or Chi-square tests, T-tests and One-Way Anova analysis, Mann Whitney U tests and Kruskal-Wallis tests, multivariate logistic regression analysis	
8	Wai Kin Chan <i>et al.</i>	2021	Association between serum bilirubin levels and progression of albuminuria in Taiwanese with type 2 diabetes mellitus. ¹⁵	D	longitudinal study	A significant association was observed between the UACRs at baseline and the serum BIL groups ($p < 0.001$)
				S	purposive sampling;	
				V	Patients diagnosed with type 2 diabetes, according to the 9th version of the International Classification of Diseases, Clinical Modification	
				I	database medical records from Chang Gung Memorial Hospital (CGMH)	
				A	ANOVA	
9	Lin Hou <i>et al.</i>	2020	Associations of serum uric acid level with diabetic	D	retrospective analysis study	UACR identified as a risk factor for
				S	purposive sampling;	

NO	Author	Year	Title	Methods (design, samples, variables, instrument, analysis)		Results
			retinopathy and albuminuria in patients with type 2 diabetes mellitus. ⁷	V	patients with type 2 DM (aged 21 to 85 years) who underwent treatment from March 2017 to September 2017 at the Department of Endocrinology, Shandong Provincial Hospital Affiliated with Shandong University.	diabetic retinopathy (DR)
				I	clinical record data	
				A	Multivariate logistic regression analysis	
10	Kazuo Kobayashi et al.	2019	Retrospective analysis of effects of sodium-glucose co-transporter 2 inhibitors in Japanese type 2 diabetes mellitus patients with chronic kidney disease. ¹⁶	D	Retrospective study	ACR correlated significantly with age and BP
				S	purposive sampling;	
				V	935 T2DM patients who were registered and visited the clinics of members of the Kanagawa Physicians Association between November 2016 and March 2017	
				I	clinical record data	
				A	Multiple linear regression analysis	

Note: D for Desain; S for sampel; V for variables; I for Instrument; A for Analysis.

Based on the article included (n=10), it was found that ACR levels were associated with cardiovascular risk in people with DM. High levels of UACR are also associated with an increased risk of CKD. ACR levels are also influenced by the time the patient has diabetes. Therefore, an ACR examination is essential for diabetic patients. Chronic kidney disease (CKD) is a clinical illness indicated by long-term changes in renal structure or function, as well as a persistent deterioration in glomerular filtration. Suppose the underlying condition needs to be addressed promptly. In that case, it advances to end-stage renal disease (ESRD), which imposes a significant healthcare cost on the patient and family, as well as a financial burden on the country.¹⁷

The eGFR and ACR are frequently tested risk factors for renal and cardiovascular outcomes. The finding that these risk variables were not linearly associated with these outcomes and were not independent of one another in predicting MACE and mortality stresses their complicated connection with each other else and to these outcomes. The KDI is a combination of these two risk variables. It incorporates data from both risk variables and has a straightforward linear association with all three outcomes. Furthermore, its ability to predict these three outcomes was comparable to complicated models that contained the eGFR and ACR, nonlinear variables, and interaction terms. As a result, the KDI may make it easier to identify high-risk patients who will benefit most from preventative medicines. Future

epidemiologic research and clinical trials should test and confirm its effectiveness as a risk stratification tool.⁸

Patients should be educated on how improved blood glucose and albuminuria management can help postpone the development of CKD. Empirical data shows that estrogen has a renoprotective impact via lowering albuminuria. However, our investigation found that the male sex had a protective effect. Our data subgroup analysis revealed that 77% of women were over 50, compared to 65% of men (P, 0.001). This means that most female patients were postmenopausal with low estrogen levels, negating the possible renoprotective benefit. UACR examination can be done using dipsticks, making it easier for laboratories with limited equipment. Two stage-3 CKD risk prediction models that used demographic and laboratory characteristics as predictors demonstrated intense discrimination and calibration and were able to predict the 3-year risk of stage-3 CKD in individuals with type 2 diabetes. The comprehensive model is appropriate for healthcare settings with extensive laboratory testing, whereas the simplified model is appropriate for primary care settings with less laboratory testing, including UACR testing. These stage-3 CKD risk prediction models provide tools for healthcare professionals to screen for the risk of developing stage-3 CKD, allowing for earlier identification, and they assist healthcare providers in adopting treatments to slow CKD development.¹⁰ Previous research also found that ACR can improve the prediction of early symptoms of DKD (diabetic kidney disease).¹⁸ This aligns with another research, which states that UACR levels can predict a decrease in kidney function early on in diabetics.¹³ Another observable marker besides UACR is blood pressure, where blood pressure and UACR correlate with early decline in kidney function.

In many countries, DN accounts for around half of all instances of end-stage renal disease. The normal clinical course of DN is microalbuminuria followed by overt albuminuria and eventually a loss in kidney function, with pathologic DN lesions progressing with increasing albuminuria. As a result, albuminuria is a clinical feature of DN. On the other hand, some diabetic individuals have reported a fast deterioration in kidney function without overt albuminuria. ACR levels also increase with the duration of diabetes.¹⁴ Increased urine ACR levels were independently linked with lower ABI in diabetic patients, and the risk of low ABI (PAD) was obvious in all subgroups investigated and after thorough adjustments. As a result, our findings indicated that higher urine ACR was related to PAD in diabetic individuals.⁶

There was a significant association between the UACRs at baseline and the serum bilirubin groups. However, there was a substantial association between bilirubin levels and baseline UACR. Higher bilirubin levels are related to a decreased likelihood of albuminuria advancement in type 2 diabetes patients, implying that serum bilirubin levels may be a surrogate indication of diabetic nephropathy progression.¹⁵

Compared to individuals with a low SUA (serum uric acid) level, those with a raised SUA level showed a higher frequency of DR and albuminuria. As a result, even within the normal range of SUA, people with somewhat high SUA levels may be predisposed to diabetic retinopathy (DR) and diabetic nephropathy (DN). As a result, SUA levels in individuals with type 2 diabetes should be closely monitored. Several diseases of the kidneys cause elevated SUA levels. A decrease in the estimated glomerular filtration rate or improper handling of filtered uric acid are two possible causes of increased SUA over the proximal tubules. The substance uric acid

is an essential component in the development of kidney diseases. The leading cause is DN, several research have also concentrated on the connection between SUA level and DN.⁷

ACR was reduced in individuals with microalbuminuria and macroalbuminuria but rose dramatically in those with normo albuminuria. Other studies found various levels of improvement in ACR. ACR was reduced in individuals with microalbuminuria and macroalbuminuria but rose dramatically in those with normo albuminuria. Other studies found varying degrees of ACR improvement. ACR was highly associated with age and blood pressure. The effect of SGLT2i on ACR was independent of age, and the use of SGLT2i appears to be an effective method for treating diabetes in advanced age. However, caution should be used in individuals with normal albuminuria or increasingly poor renal function. In addition to their direct influence on blood glucose levels, sodium-glucose co-transporter 2 inhibitors (SGLT2i) have numerous indirect benefits, such as lowering blood pressure (BP) and improving dyslipidemia and liver function.¹⁶

Reduction of UACR levels can slow kidney damage and cardiovascular disease—a reduction of UACR from baseline at 12 weeks for verinurad plus febuxostat.¹¹ Diabetes kidney disease is one of the leading causes of morbidity and death in people with diabetes. Diabetic kidney disease affects 20%-40% of persons with diabetes, both types 1 and 2. If not treated effectively, this condition will progress to end-stage renal disease (ESRD).¹⁹

DISCUSSION

The article that has been reviewed found that ACR examination is critical to monitor kidney damage in patients with type 2 diabetes. ACR can also be used as a marker of DN. ACR levels correlate with uric acid levels and bilirubin levels in patients. DM sufferers should be educated about maintaining blood sugar levels to maintain kidney conditions. Prolonged suffering from DM is also associated with ACR levels.¹⁰ The formation of Advanced Glycation End Products (AGEs) from glucose with amino acid residues in body tissues is caused by high and prolonged blood glucose levels. The kidneys eliminate AGEs in small quantities, but in people with diabetes mellitus, the number of AGEs is very high in the plasma, which makes kidney work more difficult.⁵ Chronic diabetes relates to organ damage, malfunction, and failure, particularly of the eyes, nerves, feet, blood vessels, kidneys, and heart. Diabetes has been linked to microvascular problems, including retinopathy, neuropathy, and nephropathy. Diabetes microvascular problems include kidney damage known as diabetic nephropathy (DN), which is the most prevalent consequence of type 2 diabetes mellitus and the leading cause of end-stage renal disease globally, with substantial morbidity and death. It occurs in around 40% of diabetic individuals after 10 years of type 2 diabetes mellitus diagnosis.²⁰ Diabetic kidney disease (DKD) is uncontrollably managed due to the involvement of complex pathophysiological pathways that impact practically all renal tissues, including glomeruli, tubules, interstitial, and blood vessels. Following hyperfiltration, microalbuminuria develops, followed by proteinuria and a low estimated glomerular filtration rate (eGFR). Early glycemic variability reduction (before macro albuminuria) can prevent renal function degradation.²¹ Hyperglycemia in patients with diabetes mellitus causes microalbuminuria, which can increase intraglomerular pressure. A glomerular capillary that can increase permeability. If the albumin filtration is increased in the glomerulus, exceeding the reabsorption capacity of the tubules, then there will be an increase in the excretion of albumin in the urine. Creatinine is released

from the kidneys relatively constantly in the plasma daily through filtration and secretion. Since almost all the skeleton muscles produce creatinine, individuals with larger muscles may have higher creatinine levels. Blood creatinine tests with urine creatinine usually assess the speed of glomerular filtration. A doubling of creatinine levels indicates a decrease in kidney function by 50 %.⁵ Prolonged hyperglycemia in patients can produce alterations in the basal membrane of the glomerulus, including the proliferation of mesangium cells. High blood sugar interacts with proteins, altering the structure and function of cells, including the basal membrane of the glomerulus, resulting in a broken protein barrier and protein leakage into the urine. (microalbuminuria). One typical complication is a kidney anomaly that begins with microalbuminuria and progresses to clinical proteinuria, as well as a decline in glomerular filtration rate function, which leads to kidney failure and requires more extensive management and therapy. The diagnosis of diabetic nephropathy begins with an appearance of albuminuria in patients with type 2 diabetes. When the amount of protein and albumin in the urine is still meagre, it can be detected using the standard urinalysis method; however, if it is greater than 30 mg/24 hours or greater than 20 mg/min, it is also known as microalbuminuria. The degree of albuminuria or proteinuria can also be measured by the ratio of creatinine in urine taken simultaneously, known as the albumin or creatinine ratio (ACR).²²

The emergence of chronic kidney disease (CKD) and its eventual development into this fatal condition continues to be a significant contributor to lower life expectancy and early death. Severe chronic kidney disease (CKD) requires close monitoring for indicators of disease progression and promptly referred to experts for dialysis or potential renal transplant. Proteinuria and glomerular filtration rate are kidney damage markers used by the Kidney Disease Improving Global Outcomes (KDIGO) foundation recommendations to characterize chronic kidney disease (CKD). Chronic renal disease is defined as having both parameters—abnormalities of kidney structure or function for longer than three months—along with glomerular filtration rate [GFR] less than 60 mL/min and albumin greater than 30 mg per gram of creatinine. A GFR of less than 15 mL/min is considered end-stage renal disease.²³

Patients with diabetes may experience an imbalance in their sex hormones. Research has indicated that men with diabetes have lower levels of testosterone and higher amounts of estradiol in comparison to those without the disease. Nonetheless, women with diabetes had lower levels of estrogen and higher amounts of testosterone than women without the disease, indicating that a sex hormone imbalance may be linked to diabetes. When compared to women without diabetes, females with diabetes may have lower levels of estradiol, which might increase urine albumin excretion, lower creatinine clearance, and worsen tubular fibrosis in the kidneys. These effects could raise the chance of having renal problems.²⁴

In diabetic individuals, oxidative stress has been implicated as a pathogenic factor in the development of nephropathy. Bilirubin is a potent antioxidant that mainly shields cells from fat perspiration. From biliverdin, it is produced by Reducer of biliverdin. It is transformed into biliverdin during its antioxidant action, which happens immediately. Biliverdin reductase reduces it once more to bilirubin. The specific nature of the connection between blood bilirubin level and the emergence of Diabetic people may or may not have nephropathy.

Nevertheless, it is anticipated that elevated bilirubin levels in the serum within a normal range can prevent oxidative tension and inflammation, hence averting the onset of nephropathy

caused by diabetes. Previously, low serum bilirubin levels have been linked to research. Predicts the onset of chronic renal disease among individuals with diabetes mellitus type 2.²⁵

However, many of these consequences can be mitigated by minimizing diabetic complications. This is possible with diabetes medicines. Even though a variety of drugs have been shown to reduce blood glucose (glycaemia), current care has failed to achieve and maintain ideal glycemic control in diabetic patients. Non-adherence to diabetes treatments is one of the leading causes of poor glycemic control. Noncompliance with diabetes treatment has several implications. Some of these were higher out-of-pocket expenses, increased overall healthcare costs, morbidity increases, and deaths.²⁶ Patients with demanding glycemic management and minimal HbA1c variability showed steady renal function with no deterioration. Patients' renal function would not decline if they had optimal glucose control. Early glycemic variability reduction (before macro albuminuria) can halt renal function degradation. HbA1c_CV should be monitored and minimized regularly for diabetes treatment.²¹ This study had some limitations; the data retrieved was limited from article search results in the database with unpaid criteria due to funding limitations.

CONCLUSION

UACR examination is necessary for people with type 2 diabetes to monitor the condition of the kidneys. The examination was carried out using the patient's urine sample. Low ACR levels will slow kidney damage, so routine treatment is needed in type 2 DM patients.

The national Social Security Agency on Health (BPJS) that is the Chronic Disease Management Program called as *Prolanis*, which has scheduled free examinations every 6 months for DM and HT patients, is one of the efforts of health services to be able to monitor the kidney condition of DM and HT patients so that the first step in treatment can be carried out as a follow-up to the results of the examination.

Conflict of interest

There is no conflict of interest in this research.

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