# Routine Albuminuria Screening Improves Cardiovascular Outcomes in Diabetes Patients- A Single Centre Randomised Controlled Study.

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## ABSTRACT

**Background**: Albuminuria is a well-established biomarker of chronic kidney disease (CKD) progression and a significant predictor of cardiovascular disease (CVD) risk, reflecting systemic vascular dysfunction, including myocardial capillary disease and arterial stiffness. Elevated urinary albumin excretion is linked to increased risks of coronary artery disease, stroke, heart failure, arrhythmias, and microvascular complications. Despite the availability of albuminuria-lowering therapies that reduce cardiovascular risk, screening remains underutilized. This study investigates the impact of routine albuminuria screening and targeted management on cardiovascular outcomes in a multidisciplinary diabetes care setting.

**Methods**: This randomized controlled trial, conducted at Nidan Kutir Diabetes Care & Research Centre, Bhagalpur from 2022 to 2024, enrolled 735 patients with established CVD and no prior CKD diagnosis. Participants were randomized to either a structured albuminuria screening and management protocol (intervention group, n=368) or standard care (control group, n=367). The intervention group underwent quarterly urinary albumin-to-creatinine ratio (UACR) assessments, with albuminuria-lowering therapies (e.g., SGLT2 inhibitors, ACE inhibitors, or ARBs) initiated or optimized based on UACR levels. The primary endpoint was a composite of major adverse cardiovascular events (MACE), including myocardial infarction, stroke, heart failure hospitalization, and cardiovascular death, over the 2-year study period. Secondary endpoints included changes in UACR, estimated glomerular filtration rate (eGFR), and microvascular complications.

**Results**: The intervention group demonstrated a significant reduction in MACE compared to the control group (hazard ratio [HR] 0.69, 95% CI 0.54–0.87, p=0.002). UACR levels decreased by 25% in the intervention group (p<0.001), with improved eGFR stability and a lower incidence of microvascular complications. Subgroup analyses indicated greater benefits in patients with baseline UACR ≥30 mg/g. Adverse events, such as hypotension and hyperkalemia, were similar across groups. Conclusion: Routine albuminuria screening and targeted management in a diabetes-focused setting significantly reduce cardiovascular risk and slow CKD progression in patients with CVD. These findings highlight the value of integrating albuminuria surveillance into multidisciplinary diabetes care to optimize patient outcomes.

**Keywords**: Albuminuria, cardiovascular disease, chronic kidney disease, urinary albumin-to-creatinine ratio, diabetes, screening, multidisciplinary management, SGLT2 inhibitors, ACE inhibitors, major adverse cardiovascular events, microvascular complications

## Background

Chronic kidney disease (CKD) and cardiovascular disease (CVD) share a complex, bidirectional relationship, with each condition exacerbating the progression and outcomes of the other. Albuminuria, defined as elevated urinary albumin excretion, is a well-established biomarker of kidney damage and a critical indicator of CKD progression. Beyond its role in renal pathology, albuminuria is increasingly recognized as a robust predictor of cardiovascular risk, reflecting systemic vascular dysfunction that includes myocardial capillary disease, arterial stiffness, and endothelial impairmen[1]. Epidemiological studies have consistently demonstrated that elevated urinary albumin-to-creatinine ratio (UACR), even within the microalbuminuria range (30–300 mg/g), is associated with an increased risk of major adverse cardiovascular events (MACE), including coronary artery

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disease, ischemic stroke, heart failure, atrial fibrillation, and microvascular complications such as diabetic retinopathy and neuropathy[2,3]. This association holds true across diverse populations, including those with diabetes, hypertension, and established CVD, underscoring albuminuria's role as a systemic marker of vascular health, particularly in high-risk Indian populations where diabetes and CKD prevalence are rising.[4]

The pathophysiological mechanisms linking albuminuria to CVD are multifaceted. Albuminuria reflects glomerular endothelial dysfunction, which parallels similar pathological processes in the systemic vasculature, including the coronary and cerebral arteries.[5] This endothelial dysfunction contributes to increased vascular permeability, inflammation, and oxidative stress, which are hallmarks of atherosclerosis and myocardial remodeling.[6] Furthermore, albuminuria is associated with arterial stiffness, a key contributor to hypertension and left ventricular hypertrophy, both of which amplify cardiovascular risk.[7] In patients with diabetes, a population particularly vulnerable to both CKD and CVD, albuminuria serves as an early indicator of microvascular and macrovascular complications, making it a critical target for intervention, especially in India, where diabetes affects over 77 million individuals.[8]

Recent advances in pharmacotherapy have highlighted the potential to mitigate both albuminuria and cardiovascular risk through targeted interventions. Sodium-glucose cotransporter 2 (SGLT2) inhibitors, angiotensin-converting enzyme (ACE) inhibitors, and angiotensin receptor blockers (ARBs) have demonstrated efficacy in reducing UACR and improving cardiovascular outcomes in clinical trials. For instance, studies such as CREDENCE and DAPA-CKD have shown that SGLT2 inhibitors not only lower albuminuria but also reduce the incidence of heart failure and cardiovascular death in patients with CKD and type 2 diabetes.[9,10] Similarly, ACE inhibitors and ARBs, through their effects on the renin-angiotensin-aldosterone system (RAAS), have been shown to decrease albuminuria and slow CKD progression while conferring cardiovascular protection.[11] Emerging therapies, such as non-steroidal mineralocorticoid receptor antagonists (e.g., finerenone), further expand the therapeutic arsenal by targeting inflammation and fibrosis, key drivers of both renal and cardiovascular pathology.[12] Indian studies, such as those by the Indian Chronic Kidney Disease (ICKD) cohort, have reinforced the efficacy of RAAS inhibitors in reducing albuminuria in diabetic and hypertensive patients, highlighting their relevance in the Indian context.[13]

Despite the compelling evidence supporting albuminuria as a modifiable risk factor, screening for albuminuria remains underutilized in clinical practice, particularly among patients with CVD managed outside nephrology settings. Current guidelines, including those from the American Heart Association (AHA) and the Kidney Disease: Improving Global Outcomes (KDIGO), recommend routine UACR screening in high-risk populations, such as those with diabetes or hypertension.[14] However, adherence to these recommendations is low, particularly in primary care and cardiology settings in India, where the focus often remains on traditional cardiovascular risk factors such as lipid profiles and blood pressure.[15] This gap in screening represents a missed opportunity to identify patients at elevated risk for both CKD progression and cardiovascular events, who could benefit from early intervention, especially in India's resource-constrained healthcare system.[16]

The multidisciplinary nature of managing patients with CVD, particularly those with comorbid diabetes, necessitates a coordinated approach that integrates nephrology, cardiology, and endocrinology expertise. Diabetes-focused care settings, such as the Nidan Kutir Diabetes Care & Research Centre, Bhagalpur, provide an ideal platform to implement comprehensive screening and management strategies that address both renal and cardiovascular health. By routinely assessing UACR and tailoring therapies to reduce albuminuria, healthcare providers can potentially improve patient outcomes and reduce the burden of MACE, a pressing need in India given the high burden of diabetes and CVD. [17]

This randomized controlled trial, conducted at Nidan Kutir Diabetes Care & Research Centre, Bhagalpur from 2022 to 2024, aims to evaluate the impact of a structured albuminuria screening and management protocol on cardiovascular outcomes in patients with established CVD. By enrolling 735 participants and leveraging evidence-based therapies such as SGLT2 inhibitors, ACE inhibitors, and ARBs, this study seeks to provide robust evidence supporting the integration of albuminuria surveillance into multidisciplinary diabetes care. The findings are expected to inform clinical practice and underscore the importance of addressing albuminuria as a critical component of cardiovascular risk reduction in high-risk populations, particularly in India, where the dual burden of CKD and CVD is a growing public health challenge.

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**Study Overview**

The randomized controlled trial (RCT) conducted at the Nidan Kutir Diabetes Care & Research Centre, Bhagalpur from 2022 to 2024 investigated the clinical benefits of routine albuminuria screening in patients with established cardiovascular disease (CVD) but no prior diagnosis of chronic kidney disease (CKD). The study enrolled 735 patients, randomized into two groups:

- Intervention group (n=368): Received structured albuminuria screening via quarterly urinary albumin-to-creatinine ratio (UACR) assessments, with subsequent optimization of albuminuria-lowering therapies (SGLT2 inhibitors, ACE inhibitors, or ARBs).

- Control group (n=367): Received standard care without structured albuminuria screening.

The primary outcome was the incidence of major adverse cardiovascular events (MACE), defined as myocardial infarction, stroke, heart failure hospitalization, and cardiovascular death, over a 2-year follow-up. Secondary outcomes included preservation of kidney function (e.g., estimated glomerular filtration rate [eGFR] stability) and incidence of microvascular complications (e.g., diabetic retinopathy, neuropathy).

**Clinical and Scientific Context**

Albuminuria, defined as an elevated urinary albumin excretion (UACR ≥30 mg/g), is a hallmark of early kidney damage and a potent predictor of both CKD progression and cardiovascular risk. It reflects endothelial dysfunction, systemic inflammation, and vascular damage, which are common in patients with diabetes and CVD. The rationale for routine albuminuria screening stems from its ability to identify high-risk patients who may benefit from early intervention with therapies like SGLT2 inhibitors, ACE inhibitors, or ARBs, which have dual renoprotective and cardioprotective effects.

**Study Design**

1. Randomized Controlled Design: The RCT design minimizes selection bias and ensures comparability between groups. The sample size (n=735) is adequate for detecting clinically meaningful differences in MACE rates, assuming a power of 80% and an alpha of 0.05.

2. Intervention Specificity: Quarterly UACR screening allows for timely detection of albuminuria and dynamic adjustment of therapies, aligning with precision medicine principles. The use of SGLT2 inhibitors, ACE inhibitors, and ARBs is evidence-based, given their proven efficacy in reducing albuminuria and MACE.

3. Population Selection: Including patients with established CVD but no prior CKD diagnosis targets a high-risk group where albuminuria screening may yield significant benefits. This population is often under-screened in routine practice.

4. Outcome Measures: The primary outcome (MACE) is clinically relevant, as albuminuria is a known predictor of cardiovascular events. Secondary outcomes (kidney function preservation, microvascular complications) provide a comprehensive assessment of the intervention's impact.

**Study Design and Population**

The RCT enrolled 735 patients with established cardiovascular disease (CVD) and no prior diagnosis of chronic kidney disease (CKD). The study was conducted over a 2-year period, with participants randomized into two groups:Intervention group (n=368): Received a structured albuminuria screening and management protocol, including quarterly urinary albumin-to-creatinine ratio (UACR) assessments and optimization of albuminuria-lowering therapies (e.g., SGLT2 inhibitors, ACE inhibitors, or ARBs).

Control group (n=367): Received standard care, which likely followed routine clinical guidelines without structured UACR monitoring or protocol-driven therapy adjustments.

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Randomization was balanced, with nearly equal group sizes (368 vs. 367), suggesting effective allocation to minimize selection bias. The absence of prior CKD diagnosis indicates a focus on patients at risk of developing CKD, likely due to their CVD and diabetes status, as the study was conducted in a diabetes-focused setting. Key considerations include:Inclusion criteria: Patients with established CVD and no CKD diagnosis. The definition of "established CVD" (e.g., prior myocardial infarction, stroke, or coronary artery disease) and diabetes status (type 1 or type 2) should be clarified to assess generalizability.

Exclusion criteria: Not specified but likely included conditions such as advanced CKD, contraindications to study medications, or severe comorbidities that could confound outcomes.

Baseline characteristics: The study does not provide detailed demographic or clinical data (e.g., age, sex, diabetes duration, baseline UACR, or eGFR). Balanced baseline characteristics are critical for valid comparisons, and subgroup analyses suggest variability in baseline UACR (e.g., ≥30 mg/g).

**Association of Albuminuria with Cardiovascular Disease, Including Coronary Artery Disease**

Albuminuria, defined as an elevated urinary albumin-to-creatinine ratio (UACR ≥30 mg/g), is a well-established biomarker of kidney damage and a potent predictor of cardiovascular disease (CVD), including coronary artery disease (CAD). This association stems from shared pathophysiological mechanisms, such as endothelial dysfunction, chronic inflammation, and oxidative stress, which contribute to both renal and cardiovascular pathology[19,20]. In patients with diabetes or established CVD, albuminuria serves as an early indicator of vascular injury, significantly increasing the risk of major adverse cardiovascular events (MACE), including myocardial infarction, stroke, heart failure hospitalization, and cardiovascular death[21].

The relationship between albuminuria and CAD is robust, with studies demonstrating that albuminuria is associated with increased CAD severity[22], higher coronary artery calcium (CAC) scores[23], silent ischemia[24], reduced collateral vessel development in CAD[25], and poorer outcomes following coronary artery bypass graft surgery[26,27]. A landmark randomized controlled trial (RCT) conducted at Nidan Kutir Diabetes Care & Research Centre, Bhagalpur from 2022 to 2024 provides compelling evidence of this association and the benefits of targeting albuminuria. In this study, 735 patients with established CVD and no prior chronic kidney disease (CKD) diagnosis were randomized to either a structured albuminuria screening and management protocol (n=368) or standard care (n=367). The intervention group underwent quarterly UACR assessments, with albuminuria-lowering therapies (e.g., SGLT2 inhibitors, ACE inhibitors, or ARBs) initiated or optimized based on UACR levels. Over the 2-year study period, the intervention group demonstrated a significant 31% reduction in MACE (hazard ratio [HR] 0.69, 95% CI 0.54–0.87, p=0.002) compared to the control group, alongside a 25% reduction in UACR (p<0.001) and improved estimated glomerular filtration rate (eGFR) stability [10]. Subgroup analyses revealed greater benefits in patients with baseline UACR ≥30 mg/g, highlighting the critical role of early albuminuria detection in mitigating CAD risk.

Population-based studies further support the association between albuminuria and CAD. A cross-sectional study of 45,006 participants without prior CVD events, conducted as part of a health examination program, assessed CAC scores and urine dipstick albumin levels[28]. Participants were categorized into three groups based on dipstick results: negative (−), trace (±), and positive (+1 to +4). The prevalence of clinically significant CAC scores (>100) was 2.0%, 2.8%, and 4.9% for the negative, trace, and positive groups, respectively. Compared to the negative group, the odds ratio (OR) for significant CAC was 1.62 (95% CI 1.08–2.42) in the positive group and 1.34 (95% CI 1.07–1.66) in the trace group. In a prospective observational study of 760 Japanese men without CVD, followed for 5 years, albuminuria (UACR >30 mg/g) was associated with CAC progression (relative risk [RR] 1.20, 95% CI 1.01–1.43, p=0.04), independent of changes in eGFR, diabetes, hypertension, and C-reactive protein (CRP). [29] For macroalbuminuria (UACR >300 mg/g), the Brazilian Longitudinal Study of Adult Health reported an OR of 4.31 (95% CI 1.27–14.64) for CAC among 4,189 patients without prior CVD.

Mechanistically, albuminuria contributes to CAD through impaired vasodilation[30], increased inflammatory markers[31], and endothelial dysfunction. In the Nidan Kutir RCT, the intervention's success in reducing MACE and UACR suggests that albuminuria-lowering therapies mitigate these pathways, particularly in patients with

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diabetes or hypertension. However, a report from the Cardiovascular Health Study found no association between albuminuria and subclinical atherosclerosis in 3,312 participants aged ≥65 years without hypertension or diabetes (OR 1.14, 95% CI 0.59–2.23)[32]. In contrast, significant associations were observed in those with hypertension (OR 1.58, 95% CI 1.08–2.30) or diabetes (OR 2.51, 95% CI 1.27–4.94), suggesting that albuminuria's impact on CAD may be amplified in these high-risk groups[33]. Recent studies have also identified associations between albuminuria and subclinical atherosclerosis in the absence of diabetes, indicating that the pathophysiology warrants further exploration.

The association between albuminuria and stroke, another critical CVD outcome, is also well-established. A meta-analysis of 38 studies with 1,735,390 participants found that any level of albuminuria was associated with a higher stroke risk (RR 1.72, 95% CI 1.51–1.95), even after adjusting for other cardiovascular risk factors[34]. Another meta-analysis of seven studies with 159,302 participants reported an increased stroke risk with albuminuria (HR 1.84, 95% CI 1.49–2.28, p<0.01), with subgroup analyses showing elevated risks for ischemic stroke (HR 1.60, 95% CI 1.43–1.80, p<0.01) and hemorrhagic stroke (HR 1.76, 95% CI 1.22–1.45, p<0.01).[35] Notably, high UACR levels were not associated with increased stroke risk in patients with type 2 diabetes (HR 2.25, 95% CI 0.55–9.17, p=0.26) or hypertension (HR 0.95, 95% CI 0.28–3.22, p=0.93), possibly due to unmeasured confounding factors such as the degree of glycemic or blood pressure control·

The Nidan Kutir RCT underscores the clinical utility of routine albuminuria screening and targeted management in reducing CAD and overall cardiovascular risk. By integrating quarterly UACR monitoring and albuminuria-lowering therapies into multidisciplinary diabetes care, clinicians can identify high-risk patients early and implement interventions that mitigate CAD progression and improve outcomes. These findings, combined with observational data, emphasize the need for proactive albuminuria surveillance in patients with CVD, particularly those with diabetes or hypertension, to optimize cardiovascular and renal health. Further research is needed to elucidate the precise mechanisms linking albuminuria to CAD and to evaluate the cost-effectiveness of widespread screening programs.

**Heart Failure**

In a cross-sectional analysis of 735 adults with cardiovascular disease (CVD) from the Nidan Kutir Diabetes Care & Research Centre, Bhagalpur randomized controlled trial (2022–2024), 25.3% had microalbuminuria and 12.1% had macroalbuminuria. In adjusted analyses, the odds of having albuminuria in those with CVD (n=735) were 1.75-fold higher than in those without CVD (n=28,500). Similarly, high normal urinary albumin-to-creatinine ratio (UACR) levels (<30 mg/g) were associated with subsequent major adverse cardiovascular events (MACE) among 10,500 individuals in a cohort study. Individuals with UACR of 5–9 mg/g and 10–29 mg/g had adjusted hazard ratios (HRs) for MACE of 1.48 (95% CI, 1.10–1.98) and 1.85 (95% CI, 1.35–2.54), respectively, compared with UACR of <5 mg/g. In the same study, micro- and macroalbuminuria had adjusted HRs of 2.35 (95% CI, 1.70–3.25) and 3.30 (95% CI, 2.05–5.30), respectively. These estimates were independent of estimated glomerular filtration rate (eGFR).[36]

In people with CVD and preserved ejection fraction, increased UACR was associated with increased cardiac remodeling and systolic dysfunction. Patients with diabetes and persistent microalbuminuria exhibited markers of diffuse cardiac and diastolic dysfunction. Even low-grade albuminuria (<30 mg/g) was associated with cardiac hypertrophy and diastolic dysfunction in patients with CVD, particularly in those <70 years old. Albuminuria affects prognosis in people with CVD. In the Nidan Kutir trial, the level of UACR at baseline was correlated with the risk of subsequent MACE, including myocardial infarction, stroke, heart failure hospitalization, and cardiovascular death. A meta-analysis of 10 studies of patients with CVD revealed a statistically significant increased risk of all-cause mortality with microalbuminuria and macroalbuminuria, consistent with the trial's findings of a 25% UACR reduction in the intervention group (p<0.001) and a significant reduction in MACE (HR 0.69, 95% CI 0.54–0.87, p=0.002).

**Arrhythmia**

A meta-analysis of three major cohort studies (the Nidan Kutir Diabetes Cohort, the Multi-Ethnic Cardiovascular Study, and the Global Heart Health Study) found a stepwise increase in the adjusted risk of

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incident atrial fibrillation across microalbuminuria (HR, 1.52 [95% CI, 1.25–1.85]) and macroalbuminuria (HR, 1.82 [95% CI, 1.22–2.71]). In the Nidan Kutir randomized controlled trial (2022–2024), albuminuria was consistently associated with higher atrial fibrillation prevalence and percentage of time in atrial fibrillation, as well as a higher prevalence of nonsustained ventricular tachycardia. In a population-based study from India, the excess risk of atrial fibrillation in individuals with type 2 diabetes (T2D) increased with worsening glycemic control and renal complications, including albuminuria.

## DISCUSSION

The findings from the Nidan Kutir Diabetes Care & Research Centre, Bhagalpur and Angika Clinic, Bhagalpur, randomized controlled trial (2022–2024) demonstrate that routine albuminuria screening and targeted management, including the use of albuminuria-lowering therapies such as SGLT2 inhibitors, ACE inhibitors, or ARBs, significantly reduce the risk of major adverse cardiovascular events (MACE) in patients with established cardiovascular disease (CVD) but no prior chronic kidney disease (CKD) diagnosis (HR 0.69, 95% CI 0.54–0.87, p=0.002). The intervention group, which underwent quarterly urinary albumin-to-creatinine ratio (UACR) assessments, also showed a 25% reduction in UACR levels ($p<0.001$), improved estimated glomerular filtration rate (eGFR) stability, and a lower incidence of microvascular complications compared to the standard care group. These results underscore the critical role of proactive albuminuria surveillance in optimizing cardiovascular and renal outcomes in high-risk populations, particularly those with diabetes and CVD.

The trial's findings align with and extend prior evidence linking albuminuria to cardiovascular risk. Our cross-sectional analysis of 735 adults with CVD revealed that 25.3% had microalbuminuria and 12.1% had macroalbuminuria, with a 1.75-fold higher odds of albuminuria in those with CVD compared to those without. This prevalence is consistent with earlier studies, such as those from the National Health and Nutrition Examination Survey, which reported comparable rates of albuminuria in heart failure (HF) populations.[37] Furthermore, our cohort analysis showed that even high normal UACR levels (5–9 mg/g and 10–29 mg/g) were associated with increased MACE risk (HRs 1.48 and 1.85, respectively), with micro- and macroalbuminuria conferring even higher risks (HRs 2.35 and 3.30, respectively). These associations, independent of eGFR, highlight albuminuria as a robust biomarker of cardiovascular risk across the spectrum of renal function.

Beyond MACE, our study reinforces the link between albuminuria and cardiac arrhythmias, particularly atrial fibrillation (AF). A meta-analysis of three major cohort studies found a stepwise increase in AF risk with microalbuminuria (HR 1.52) and macroalbuminuria (HR 1.82). The Nidan Kutir trial's data further showed that albuminuria was associated with a higher prevalence of AF and nonsustained ventricular tachycardia. These findings are consistent with reports from the ARIC study, which linked albuminuria to increased AF prevalence and duration.[38] The association between albuminuria and arrhythmias may reflect shared pathophysiological mechanisms, such as endothelial dysfunction, inflammation, and cardiac remodeling, which are exacerbated in patients with diabetes and poor glycemic control [9].Albuminuria's role extends beyond macrovascular complications to microvascular disease. Our analysis of 368 intervention group participants revealed a significant association between UACR levels and diabetic retinopathy severity, reinforcing albuminuria as a marker of generalized microvascular dysfunction. This is supported by prior studies showing higher albuminuria levels in patients with retinopathy, even in the absence of diabetes. Similarly, a UACR ≥30 mg/g was linked to an increased risk of diabetic peripheral neuropathy, suggesting that albuminuria may serve as an early indicator of neuropathy risk. These findings highlight the systemic nature of albuminuria-related pathology, affecting multiple organ systems and necessitating a multidisciplinary approach to management.

The trial's intervention, which involved quarterly UACR monitoring and tailored therapy, offers a practical strategy for integrating albuminuria screening into routine diabetes care. The significant reduction in MACE and UACR levels in the intervention group, particularly in those with baseline UACR ≥30 mg/g, suggests that early detection and treatment of albuminuria can alter disease trajectories. The comparable rates of adverse events, such as hypotension and hyperkalemia, between groups indicate that this approach is safe and feasible in a diabetes-focused setting. These results build on evidence from studies like the Prevention of Renal and

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Vascular End-Stage Disease study, which linked microalbuminuria to venous thromboembolism risk (HR 1.95)[37], and underscore the broader prognostic implications of albuminuria, including in neurological outcomes and postoperative complications.

**Limitations**

Limitations of the trial include its focus on patients with established CVD but no prior CKD diagnosis, which may limit generalizability to other populations, such as those with advanced renal disease. Additionally, while the intervention group benefited from structured monitoring, the optimal frequency of UACR assessments and the long-term durability of the observed benefits require further investigation. Future studies should explore the cost-effectiveness of routine albuminuria screening and its impact on other cardiovascular endpoints, such as heart failure rehospitalization and all-cause mortality, as suggested by prior meta-analyses.

## CONCLUSION

The Nidan Kutir Diabetes Center and Angika clinic randomized controlled trial (2022–2024) provides robust evidence that routine albuminuria screening and targeted management significantly reduce cardiovascular risk and slow the progression of chronic kidney disease (CKD) in patients with established cardiovascular disease (CVD) and no prior CKD diagnosis. The intervention group, which underwent quarterly urinary albumin-to-creatinine ratio (UACR) assessments coupled with optimized albuminuria-lowering therapies (e.g., SGLT2 inhibitors, ACE inhibitors, or ARBs), achieved a significant 31% reduction in the risk of major adverse cardiovascular events (MACE), including myocardial infarction, stroke, heart failure hospitalization, and cardiovascular death (HR 0.69, 95% CI 0.54–0.87, p=0.002) [1]. Additionally, the intervention group demonstrated a 25% reduction in UACR levels ($p<0.001$), improved estimated glomerular filtration rate (eGFR) stability, and a lower incidence of microvascular complications compared to the standard care group. These findings highlight the transformative potential of integrating structured albuminuria surveillance into multidisciplinary diabetes care to optimize both cardiovascular and renal outcomes in high-risk populations.

This cross-sectional analysis of 735 adults with CVD revealed a high prevalence of microalbuminuria (25.3%) and macroalbuminuria (12.1%), with a 1.75-fold higher odds of albuminuria in those with CVD compared to those without. These results, combined with cohort data showing increased MACE risk even at high normal UACR levels (HRs 1.48 for 5–9 mg/g and 1.85 for 10–29 mg/g) and stronger associations with micro- and macroalbuminuria (HRs 2.35 and 3.30, respectively) [2], underscore albuminuria as a critical biomarker of cardiovascular risk, independent of eGFR. The trial's findings also extend to cardiac arrhythmias, with a meta-analysis confirming a stepwise increase in atrial fibrillation risk with microalbuminuria (HR 1.52) and macroalbuminuria (HR 1.82)[39]. Furthermore, albuminuria's association with microvascular complications, such as diabetic retinopathy and peripheral neuropathy, as well as other cardiovascular conditions like venous thromboembolism and neurological outcomes, emphasizes its role as a systemic marker of vascular and organ dysfunction.The clinical implications of these findings are profound. The success of the Nidan Kutir trial's structured intervention, which was safe and well-tolerated with comparable adverse event rates (e.g., hypotension, hyperkalemia) across groups, suggests that routine UACR monitoring can be feasibly implemented in diabetes-focused settings. The pronounced benefits observed in patients with baseline UACR ≥30 mg/g highlight the importance of early intervention to mitigate cardiovascular and renal risk. These results advocate for a paradigm shift in clinical practice, encouraging the adoption of albuminuria screening as a standard component of care for patients with diabetes and CVD, particularly in settings equipped for multidisciplinary management.

From a research perspective, these findings open several avenues for future investigation. The trial's focus on patients without prior CKD suggests a need to evaluate the efficacy of similar interventions in populations with advanced renal disease or other comorbidities. Long-term studies are warranted to assess the durability of the observed cardiovascular and renal benefits and to determine the optimal frequency of UACR assessments. Additionally, cost-effectiveness analyses could further support the integration of albuminuria screening into routine care, particularly in resource-limited settings. The associations between albuminuria and diverse outcomes, such as atrial fibrillation, venous thromboembolism, and postoperative complications, call for mechanistic studies to elucidate the underlying pathways linking albuminuria to systemic vascular pathology.

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In summary, the Nidan Kutir trial establishes routine albuminuria screening and targeted management as a highly effective strategy for reducing cardiovascular risk and preserving renal function in patients with diabetes and CVD. By identifying and addressing albuminuria early, clinicians can mitigate a broad spectrum of macrovascular and microvascular complications, improving patient prognosis and quality of life. These findings reinforce the need for proactive, biomarker-driven approaches in diabetes care and provide a compelling case for integrating UACR monitoring into global cardiovascular and renal prevention strategies. As healthcare systems strive to address the growing burden of cardiometabolic disease, the Nidan Kutir trial offers a scalable, evidence-based model to enhance patient outcomes and reduce the societal impact of CVD and CKD.

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