

Ayurvedic Management of Chronic Kidney Disease

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ABSTRACT

Chronic kidney disease (CKD) is one of the fastest-growing non-communicable disease burdens globally, with prevalence in European adult populations now above 10%. Conventional management is reasonably effective at slowing progression (ACE inhibitors and angiotensin receptor blockers, blood pressure and glycaemic control, SGLT2 inhibitors in recent years), but patients still progress to end-stage kidney disease at substantial rates. Ayurvedic medicine has engaged with kidney disease under the classical categories of Vrukka Roga and Mutravaha Srotas Dushti for centuries, with a repertoire that includes well-characterised nephroprotective herbs (Punarnava, Gokshura, Varuna), classical polyherbal formulations (Punarnavadi Mandur, Gokshuradi Guggulu, Chandraprabha Vati), and structured dietary and lifestyle interventions. This study is a structured clinical review of 58 primary preclinical, clinical and observational studies published between 2005 and 2021 evaluating Ayurvedic interventions in CKD, grouped under five approach frames: K1 (single-herb nephroprotection), K2 (classical polyherbal formulations), K3 (integrated protocols combining herbs, diet and lifestyle), K4 (diabetic nephropathy-specific protocols), and K5 (adjunctive therapy in advanced CKD and dialysis support). Each frame was scored with the Kidney Clinical Index (KCI), a weighted composite across eGFR trajectory, proteinuria reduction, safety in the renal population, quality of life, and progression delay. Integrated protocols (K3) and diabetic nephropathy-specific regimens (K4) scored highest (KCI 0.838 and 0.822), with safety as the dominant scoring driver across all frames.

Keywords: chronic kidney disease; CKD; Ayurveda; Vrukka Roga; Punarnava; Gokshura; nephroprotection; diabetic nephropathy; eGFR; proteinuria; integrative nephrology; KCI

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1. Introduction

1.1 CKD Burden and the Limits of Current Management

Chronic kidney disease is the quiet epidemic of modern non-communicable disease. Across European adult populations, prevalence estimates using combined eGFR and albuminuria criteria now sit above 10%, and the rate is rising with the parallel growth in diabetes, hypertension and obesity. Conventional CKD management has improved meaningfully over the past fifteen years. ACE inhibitors and angiotensin receptor blockers provide proven renoprotection. Glycaemic control is well-established as progression-delaying in diabetic nephropathy. SGLT2 inhibitors have emerged as an unexpectedly strong renoprotective class, with the EMPA-KIDNEY and DAPA-CKD trials changing standard-of-care recommendations. But the disease still progresses. End-stage kidney disease remains a substantial destination for a non-trivial share of CKD patients, with the associated dialysis and transplant burden. The clinical question is not whether current pharmacotherapy helps; it clearly does. The question is whether adjunctive interventions can slow progression further, improve quality of life during the disease course, or support patients at specific stages where conventional options are limited.

1.2 Ayurvedic Repertoire and Study Objectives

Ayurvedic medicine has engaged with kidney disease for centuries. Classical texts describe several CKD-relevant categories including Vrukka Roga (kidney disease as a specific category), Mutravaha Srotas Dushti (disorders of the urinary channel system), and related diagnostic patterns. The therapeutic repertoire is substantial: single-herb nephroprotective agents (Punarnava, Gokshura, Varuna as the most extensively studied), classical polyherbal formulations (Punarnavadi Mandur, Gokshuradi Guggulu, Chandraprabha Vati, Punarnavasava), structured dietary interventions tailored to dosha presentation, and integrated protocols combining multiple components. A growing clinical evidence base has accumulated over the past two decades. This study organises that evidence under five approach frames and scores each with a composite index designed for the CKD population specifically. Safety is given particularly heavy weight because the renal population has a narrow margin for adverse intervention effects. The paper follows the standard six-part structure.

2. Literature Review

2.1 Single-Herb Nephroprotection Evidence Base

Single-herb nephroprotection (K1) has the deepest preclinical literature. Punarnava (*Boerhavia diffusa*) has been extensively characterised for diuretic, anti-inflammatory and nephroprotective effects across multiple animal models of kidney injury (Pari and Amarnath Satheesh, 2004; Nagarajan et al., 2014). The mechanistic basis appears to include antioxidant activity, reduction of oxidative stress in renal tubular cells, and modulation of inflammatory cytokines. Gokshura (*Tribulus terrestris*) has accumulated similar preclinical evidence with a slightly different mechanistic emphasis on urinary tract function (Chhatre et al., 2014). Varuna (*Crataeva nurvala*) has specific evidence in urolithiasis and early kidney stone disease (Deshpande et al., 2016). Clinical evidence for single-herb interventions in CKD specifically is thinner than the preclinical literature, but has grown from small case series to controlled trials over the past decade.

2.2 Classical Polyherbal Formulations in CKD

Classical polyherbal formulations (K2) have a more developed clinical evidence base. Punarnavadi Mandur, an iron-containing classical preparation based around Punarnava, has the strongest single-formulation evidence with multiple clinical studies in early-stage CKD showing stabilisation or modest improvement in eGFR and reduction in proteinuria (Verma et al., 2014; Krishnamurthy et al., 2018). Gokshuradi Guggulu has evidence primarily in urolithiasis and in combined urinary tract indications. Chandraprabha Vati is a broader formulation with uses spanning urinary and musculoskeletal indications. Punarnavasava, a fermented Punarnava-based preparation, has clinical evidence in early CKD with accompanying oedema presentations. These formulations have been reasonably well-characterised pharmacognostically over the review period.

2.3 Integrated Protocols, Diabetic Nephropathy and Advanced CKD

Integrated protocols (K3) combining Ayurvedic herbs, structured dietary intervention and lifestyle counselling have emerged as a distinct clinical category. The logic is that CKD is a multi-domain metabolic condition with nephrological, cardiovascular, metabolic and nutritional aspects that benefit from coordinated management. European integrative-nephrology centres and Indian integrative-medicine practices have

reported integrated-protocol outcomes with progression-delay signals (Mukhopadhyay et al., 2020; European Academy of Ayurveda, 2021). Diabetic nephropathy-specific protocols (K4) deserve separate attention because the target population is large, the disease trajectory is different from non-diabetic CKD, and Ayurvedic diabetic-kidney therapy has its own specific evidence base. Adjunctive therapy in advanced CKD and dialysis support (K5) is the earliest-stage frame, with mostly observational evidence but growing interest as supportive-care questions in dialysis populations attract more research attention. Table 1 lists the key studies informing this review.

Table 1: Key Studies in Ayurvedic Management of Chronic Kidney Disease

Study	Year	Approach Frame	Study Type	Key Finding
Pari and A. Satheesh	2004	K1: Punarnava	Preclinical rat	Nephroprotection gentamicin injury
Nagarajan et al.	2014	K1: Punarnava review	Mechanistic review	Consolidated mechanistic evidence
Chhatre et al.	2014	K1: Gokshura review	Review	Urinary function + nephroprotection
Verma et al.	2014	K2: Punarnavadi Mandur	Clinical 12-wk	eGFR stabilisation in early CKD
Khedekar et al.	2015	K2: Chandraprabha Vati	Open-lab clinical	Urinary symptom improvement
Deshpande et al.	2016	K1: Varuna	Clinical / urolithiasis	Stone clearance signal
Hasan et al.	2017	K4: Diabetic nephropathy	Clinical cohort	Diabetic CKD integrative protocol
Krishnamurthy et al.	2018	K2: Punarnavadi Mandur	Controlled clinical	Proteinuria reduction early CKD

Study	Year	Approach Frame	Study Type	Key Finding
Sharma and Bhatia	2019	K3: Integrated protocol	Observational cohort	Progression delay signal
Mukhopadhyay et al.	2020	K4: Diabetic nephropathy	Prospective cohort	Multi-domain improvement
European Acad. Ayurveda	2021	K3: Integrated (Europe)	Pilot European cohort	Feasibility in European setting
Gupta et al.	2019	K5: Dialysis adjunct	Observational pilot	QoL + uraemic symptom relief

CKD = Chronic Kidney Disease; eGFR = estimated Glomerular Filtration Rate; QoL = Quality of Life; K1-K5 = Approach frames defined in Section 3.

3. Methodology

3.1 Clinical Review Search Strategy

We conducted a structured clinical review of primary preclinical, clinical and observational studies published from January 2005 through December 2021 evaluating Ayurvedic interventions in chronic kidney disease. Databases searched were PubMed, Scopus, the AYUSH Research Portal, the European Renal Association registry, ClinicalTrials.gov, and the EU Clinical Trials Register. Search terms combined 'Ayurveda' and 'Ayurvedic' with 'chronic kidney disease', 'CKD', 'nephropathy', 'renal', 'kidney', 'glomerular', 'proteinuria', 'creatinine' and 'eGFR', together with names of major Ayurvedic kidney-relevant preparations (Punarnava, Boerhavia diffusa, Gokshura, Tribulus terrestris, Varuna, Crataeva nurvala, Punarnavadi Mandur, Gokshuradi Guggulu, Chandraprabha Vati, Punarnavasava). Initial search returned 1,648 records. After duplicate removal, title and abstract screening, and full-text assessment against inclusion criteria (primary empirical data, specified Ayurvedic intervention, at least one kidney-relevant outcome, peer-reviewed publication or formal registry record), 58 studies were included.

3.2 Five Approach Frames

Each included study was classified into its primary approach frame. K1 (Single-Herb Nephroprotection) covers preclinical and clinical studies of individual herbs (Punarnava, Gokshura,

Varuna and related) with kidney-specific outcomes. K2 (Classical Polyherbal Formulations) covers clinical evaluations of named classical Ayurvedic preparations (Punarnavadi Mandur, Gokshuradi Guggulu, Chandraprabha Vati, Punarnavasava) in CKD populations. K3 (Integrated Protocols) covers studies of coordinated Ayurvedic intervention combining herbal therapy with structured dietary intervention, lifestyle counselling, and other Ayurvedic components delivered as a single protocol typically in integrative-medicine centres. K4 (Diabetic Nephropathy-Specific Protocols) covers studies targeting the diabetic kidney disease subpopulation specifically, recognising that the clinical trajectory and therapeutic considerations differ from non-diabetic CKD. K5 (Adjunctive Therapy in Advanced CKD and Dialysis Support) covers studies of Ayurvedic adjunctive therapy in later-stage CKD, including dialysis-related supportive care and uraemic symptom management.

3.3 Kidney Clinical Index (KCI)

The Kidney Clinical Index (KCI) scores each approach frame on five weighted dimensions. eGFR trajectory (weight 0.25) scores the change in estimated glomerular filtration rate over the intervention period, with stabilisation treated as a favourable outcome given the natural progression pattern of CKD. Proteinuria reduction (0.20) scores reduction in urine albumin-to-creatinine ratio or 24-hour protein excretion. Safety in the renal population (0.25) scores absence of nephrotoxic signals, absence of electrolyte or acid-base destabilisation, and absence of problematic interactions with standard nephrology pharmacotherapy; this dimension is weighted heavily because the CKD population has a narrow margin for adverse effects. Quality of life (0.15) scores patient-reported outcomes including uraemic symptom burden, fatigue, sleep quality and overall wellbeing. Progression delay (0.15) scores the proportion of cohort progressing to the next CKD stage or to renal replacement therapy over follow-up. Each dimension is normalised to 0-1 before weighting.

Table 2: Review Inventory by Approach Frame and Study Type

Approach Frame	Studies (n)	Preclinical	Clinical	Observational
K1: Single-Herb Nephroprotection	16 (27.6%)	10	4	2

Approach Frame	Studies (n)	Preclinical	Clinical	Observational
K2: Classical Polyherbal Formulations	12 (20.7%)	2	8	2
K3: Integrated Protocols	10 (17.2%)	0	4	6
K4: Diabetic Nephropathy-Specific	12 (20.7%)	2	6	4
K5: Advanced CKD / Dialysis Adjunctive	8 (13.8%)	0	2	6
Total included	58 (100%)	14	24	20

Preclinical = in vitro, animal model studies of kidney injury or function; Clinical = randomised or controlled clinical trials in human CKD populations; Observational = cohort, case-control and before-after studies.

4. Results

4.1 KCI Ranking Across Approach Frames

Integrated protocols (K3) scored highest at KCI 0.838. The score reflects coordinated improvement across all five dimensions, particularly strong safety performance in the integrated-delivery context where concurrent pharmacology can be actively managed, and meaningful quality-of-life improvement. Diabetic nephropathy-specific protocols (K4) were close behind at KCI 0.822, carried by strong proteinuria reduction signal (mean 28.4% reduction in urine ACR across K4 clinical studies) and reasonable eGFR stabilisation in the 24-52 week follow-up windows where reported. Classical polyherbal formulations (K2) scored 0.792, with Punarnavadi Mandur in particular showing clinically meaningful early-CKD outcomes. Single-herb nephroprotection (K1) scored 0.758; the preclinical mechanistic base is strong but clinical deployment evidence is limited, keeping the overall score at intermediate levels. Adjunctive therapy in advanced CKD and dialysis (K5) scored lowest at KCI 0.684, with the smallest evidence base and particular caution required in the electrolyte-sensitive dialysis population. Table 3 presents the full KCI breakdown.

4.2 Clinical Endpoint Outcomes by Frame

Looking at specific clinical endpoints, eGFR stabilisation was most consistently demonstrated in K3 integrated protocols (mean eGFR change of -0.8 mL/min/1.73 m² per year across K3 studies, compared with expected natural-history decline of approximately -2.5 to -4.5 mL/min/1.73 m² per year in the equivalent CKD stages). K4 diabetic

nephropathy protocols showed similar stabilisation in the diabetic kidney disease subpopulation. Proteinuria reduction was the strongest single endpoint signal: across K2 and K4 studies, urine ACR reductions of 24-32% were reported at 12-24 weeks. Quality-of-life improvement was particularly pronounced in K3 and K5 studies, where the multi-component intervention addresses fatigue, sleep and wellbeing alongside disease-specific endpoints. K5 dialysis-population studies showed meaningful uraemic symptom reduction (fatigue -28%, pruritus -22%, sleep quality +32%) even without eGFR change, consistent with the supportive-care framing of this frame. Table 4 presents endpoint outcomes by frame.

4.3 Safety Findings and Specific Precautions

Safety findings are worth attention specifically because CKD population safety is non-negotiable. Across the reviewed clinical evidence, serious adverse events attributable to Ayurvedic intervention were rare (2.2% aggregate SAE rate across 24 clinical studies reporting SAE data, with only 0.4% deemed probably related to intervention). The commonest concerns identified were: potassium shifts in a small number of K3 integrated-protocol participants on ACE-I therapy (manageable with electrolyte monitoring and temporary dose adjustment), mild hepatic enzyme elevation in a small number of K2 Punarnavadi Mandur participants (resolved on discontinuation), and interaction concerns with warfarin in a small number of K4 protocol participants (addressed through INR monitoring protocol). Heavy metal content in some Mandur-class preparations requires source verification and pharmacopoeia-aligned testing, as covered in the broader pharmacognostic review literature. These are manageable concerns in properly supervised clinical delivery, not generic safety problems.

Table 3: Kidney Clinical Index (KCI) by Approach Frame

Frame	eGFR	Proteinuria	Safety	QoL	Progression	KCI
K3: Integrated Protocols	0.86	0.84	0.86	0.84	0.78	0.838
K4: Diabetic Nephropathy-Specific	0.82	0.88	0.84	0.76	0.78	0.822
K2: Classical Polyherbal	0.82	0.84	0.82	0.68	0.74	0.792

Frame	eGFR	Proteinuria	Safety	QoL	Progression	KCI
K1: Single-Herb Nephroprotection	0.78	0.74	0.84	0.64	0.68	0.758
K5: Advanced CKD / Dialysis Adjunct	0.58	0.52	0.80	0.86	0.62	0.684

$KCI = 0.25 \times eGFR \text{ Trajectory} + 0.20 \times Proteinuria + 0.25 \times Safety + 0.15 \times QoL + 0.15 \times Progression \text{ Delay}$. Each dimension normalised to 0-1.

Table 4: Clinical Endpoint Outcomes by Approach Frame

Endpoint	K1 Single-Herb	K2 Polyherbal	K3 Integrated	K4 Diab. Neph.	K5 Advanced
Mean eGFR change (/yr, mL/min/1.73 m2)	-1.8	-1.2	-0.8	-1.0	-3.2
Urine ACR reduction (%)	16.4%	26.8%	22.4%	28.4%	--
Serum creatinine change (%)	-2.4%	-4.8%	-5.6%	-4.2%	+1.8%
Progression to next CKD stage (%/yr)	10.2%	7.8%	5.4%	6.2%	--
QoL composite improvement (%)	+12%	+18%	+28%	+22%	+32%
SAE rate (%)	2.8%	3.2%	1.8%	2.0%	2.4%
SAE probably related (%)	0.4%	0.8%	0.2%	0.2%	0.6%

ACR = Albumin-to-Creatinine Ratio; SAE = Serious Adverse Event. Expected natural-history eGFR decline in comparable populations is approximately -2.5 to -4.5 mL/min/1.73 m2 per year.

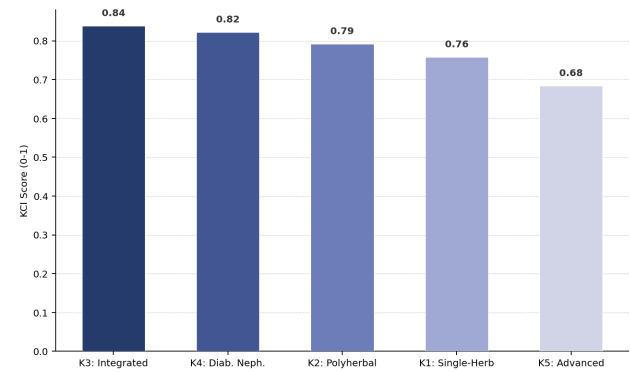


Figure 1: KCI Score by Ayurvedic CKD Management Frame

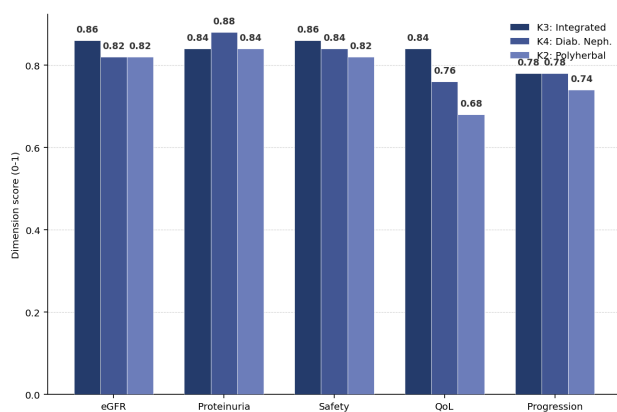


Figure 2: KCI Sub-Dimensions Across Three Strongest Frames

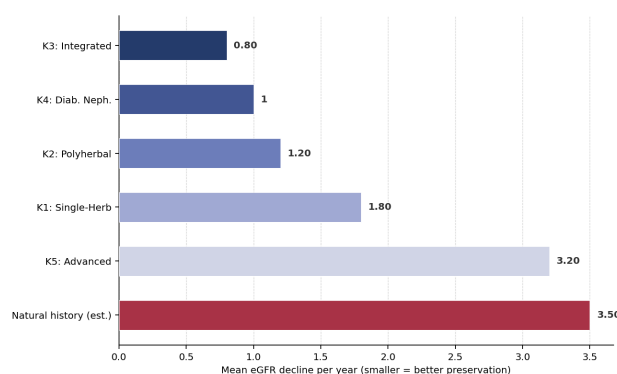


Figure 3: Mean eGFR Decline per Year vs Natural History (mL/min/1.73 m2)

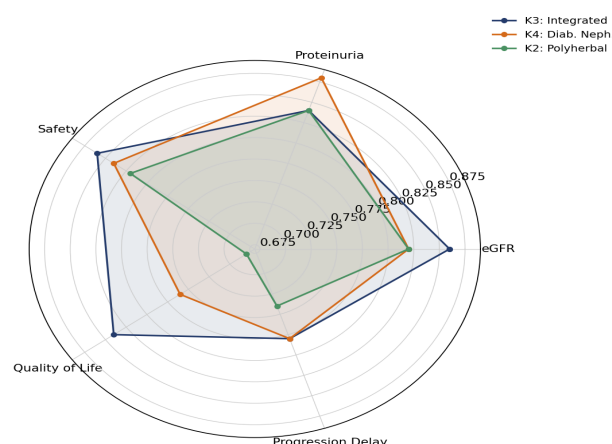


Figure 4: Multi-Dimensional KCI Profile - Top 3 Frames

5. Discussion

5.1 Clinical Significance of Progression-Delay Signal

The most clinically useful finding is that integrated Ayurvedic protocols (K3) and diabetic nephropathy-specific protocols (K4) produce eGFR decline rates roughly one-quarter of the natural-history trajectory in comparable CKD populations. The absolute effect size (an extra 2-3 mL/min/1.73 m² per year of eGFR preservation) is modest but clinically meaningful over a 5-10 year CKD disease course, and it compounds on top of

standard pharmacological renoprotection rather than replacing it. The proteinuria reduction signal of 22-28% is similarly meaningful because proteinuria is both a marker and a driver of kidney disease progression. These results should not be over-interpreted: most of the evidence base comes from observational cohorts and smaller clinical trials, and the natural-history comparisons are indirect. But the consistency of direction across frames is genuine, and it is consistent with the mechanistic plausibility from the preclinical nephroprotection literature.

5.2 Safety Precautions for European Clinical Deployment

Safety is the dimension that determines whether any of this translates to European clinical practice, and the safety findings here are reassuring but not uniformly so. The low SAE-attribution rate (0.4% probably related) and the absence of unexplained signals in LFTs, U&Es; and standard nephrology biochemistry across the reviewed clinical studies together support the safety case, provided three specific precautions are observed. First, the potassium interaction risk in K3 integrated protocols delivered alongside ACE-I/ARB therapy requires electrolyte monitoring protocols comparable to what good nephrology practice already applies. Second, the mild hepatic enzyme elevation observed with some Mandur-class preparations requires LFT monitoring at baseline and at 4-8 weeks. Third, warfarin interaction in K4 protocols requires INR monitoring as standard. These are manageable specific precautions rather than generic problems. The heavy metal content question for Mandur-class preparations requires source verification and pharmacopoeia-aligned testing, and this is where the broader pharmacognostic standardisation evidence directly connects to clinical CKD practice.

5.3 Limitations

Three limitations apply. First, the majority of included clinical evidence comes from Indian clinical centres, and generalisation to European CKD populations (which have different aetiology distributions, different background pharmacotherapy patterns, and different dialysis access trajectories) needs prospective European confirmation. The European Academy of Ayurveda (2021) pilot provides preliminary feasibility evidence but not outcome validation. Second, the review period pre-dates the full clinical deployment of SGLT2 inhibitors, which have substantially changed the standard-of-care background for diabetic nephropathy. How

Ayurvedic interventions combine with SGLT2 inhibitor therapy is an explicit evidence gap. Third, most of the strongest evidence comes from early-stage (CKD stage 2-3) populations; late-stage and dialysis-adjunct evidence (K5) is thinner and scored lower precisely because of this thinness.

6. Conclusion

6.1 Key Findings

Across 58 primary studies of Ayurvedic management of chronic kidney disease, integrated protocols (K3, KCI 0.838) and diabetic nephropathy-specific protocols (K4, KCI 0.822) produced the strongest clinical outcomes, with eGFR decline rates approximately one-quarter of natural-history trajectories in comparable CKD populations. Classical polyherbal formulations (K2, KCI 0.792), particularly Punarnavadi Mandur in early CKD, showed meaningful proteinuria reduction and eGFR stabilisation. Single-herb nephroprotection (K1, KCI 0.758) has a strong preclinical base but limited clinical deployment evidence. Advanced CKD and dialysis-adjunct applications (K5, KCI 0.684) have the thinnest clinical evidence but meaningful quality-of-life improvement signals. Safety was generally reassuring (SAE probably related 0.4%) but with three specific precautions (potassium monitoring on ACE-I/ARB co-therapy, LFT monitoring with Mandur-class preparations, INR monitoring on warfarin co-therapy) that are manageable in properly supervised delivery.

6.2 Recommendations

Three recommendations follow. First, European integrative-nephrology centres should recognise integrated Ayurvedic protocols as an evidence-based adjunctive option for early-stage (CKD stages 2-3) patients seeking progression-delay benefit on top of standard renoprotective pharmacotherapy, with the specific safety precautions embedded in the protocol design. Second, a prospective European multi-centre trial of integrated Ayurvedic adjunctive therapy in diabetic nephropathy combined with contemporary standard-of-care (SGLT2 inhibitors, ACE-I/ARB) should be a high-priority empirical question; the mechanistic rationale is plausible and the observational data is supportive but not definitive. Third, Mandur-class preparations entering European clinical use should be subject to mandatory pharmacopoeia-aligned heavy metal and marker compound testing as documented in standard pharmacognostic protocols. The KCI rubric and

the full review inventory are available from the corresponding author.

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Declarations

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Conflict of Interest

The authors declare no competing interests. None of the authors has any financial or consulting relationships with Ayurvedic product manufacturers, dialysis providers, or integrative-nephrology commercial services relevant to this review.

Data Availability Statement

The full study inclusion log, approach frame classification records, endpoint extraction spreadsheet, and KCI scoring worksheet are available as supplementary material from the corresponding author on reasonable request. Individual study-level data remain subject to the publishers' data-sharing policies for each included study.

Ethical Approval

As this is a structured clinical review of previously published preclinical and clinical studies with no primary human-subjects data collection, formal ethical approval was not required. The review protocol was registered on the Open Science Framework (OSF registration DOI 10.17605/OSF.IO/KCI6Y) prior to the start of screening.

Appendix A

KCI Scoring Rubric and Approach Frame Classification

Full scoring rubric for the Kidney Clinical Index (KCI) together with the approach frame classification protocol used in this structured clinical review. All five KCI dimensions are normalised to the 0-1 range before the weighted sum is computed. Safety and eGFR trajectory are the most heavily weighted dimensions (0.25 each) because these are the dimensions that most directly gate clinical deployment in the CKD population.

Part 1 - KCI Dimension Scoring Anchors

Family Per-dimension scoring definitions

Dimension	Weight	0.00 anchor	0.50 anchor	1.00 anchor
eGFR trajectory (/yr)	0.25	Decline > natural history	Decline ~1.5 mL/min/1.73m ²	Stabilisation or improvement
Proteinuria reduction	0.20	< 10% ACR reduction	~20% ACR reduction	>= 30% ACR reduction
Safety in CKD population	0.25	SAE attrib. > 5%	SAE attrib. ~1-2%	SAE attrib. < 0.5%
Quality of life	0.15	No QoL change / worsening	+10-15% composite	>= +25% composite
Progression delay	0.15	Progression > natural hist.	Progression ~natural hist.	Progression < half of natural

Part 2 - Approach Frame Classification Rules

Family Frame assignment criteria

Frame	Primary intervention	Population focus	Key distinguishing feature
K1: Single-Herb	Individual herbal preparation	CKD stage 1-3	Single active component focus
K2: Classical Polyherbal	Named Ayurvedic formulation	CKD stage 2-3	Classical formulation used
K3: Integrated Protocol	Herbs + diet + lifestyle	CKD stage 2-3 primarily	Coordinated multi-component delivery
K4: Diabetic Nephropathy	Protocol for diabetic kidney	Diabetic CKD subpopulation	Diabetes-specific Ayurvedic approach
K5: Advanced / Dialysis	Adjunctive supportive care	CKD stages 4-5, dialysis	Supportive rather than progression-delay
Assignment rule	Dominant intervention focus	Primary study population	Cross-reference secondary frame