

# AYURVEDIC PERSPECTIVES ON KIDNEY HEALTH: INTEGRATIVE APPROACHES TO RENAL DISEASE MANAGEMENT

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## ABSTRACT

Renal diseases, including chronic kidney disease (CKD), diabetic nephropathy, and nephrolithiasis, represent a significant and escalating global health burden. Despite advances in conventional nephrology, limitations persist in early detection, prevention, and long-term management. This review explores Ayurvedic perspectives on kidney health and evaluates the potential role of integrative approaches in renal disease management. Classical Ayurvedic concepts of Vrikka, Mutravaha Srotas, Tridosha, Agni, Ama and Dhatu-poshana can be used as a systems-based model of renal physiology and pathogenesis. Renal disorders are explained as having been caused by the imbalance of the Nidana, blocked metabolism, and blocked channels which are similar to the modern day processes, including oxidative stress, inflammation, and fibrosis. The nephroprotective properties of many Ayurvedic botanicals have been supported by preclinical evidence that shows these Ayurvedic botanicals have antioxidant, anti-inflammatory and cytoprotective properties in experimental models. There is an increasingly growing number of clinical studies that find potential benefits in CKD, diabetic nephropathy and urinary stone disease but due to methodological heterogeneity and a lack of large scale trials, no definitive conclusions can be made. Safety considerations—including herb–drug interactions, nephrotoxicity risk, and quality control challenges such as heavy metal contamination—highlight the importance of pharmacovigilance and regulatory oversight. Integrative models combining Ayurvedic principles with guideline-based nephrology may offer complementary benefits, particularly in early-stage disease, prevention, and symptom management. Personalized approaches grounded in constitutional profiling align with contemporary precision medicine frameworks.

**KEYWORDS:** Chronic kidney disease; Ayurveda; Nephroprotection; Integrative medicine; Personalized renal care.

## 1. INTRODUCTION

Chronic kidney disease (CKD) has become an important international issue of public health, whose prevalence has been steadily rising in the last thirty years. According to Global Burden of Disease (GBD) Study 2017, CKD has been noted to impact hundreds of millions of people across the world and is one of the most common causes of years lived with disability and premature death [1]. Further projections using GBD 2019 data have verified the consistent rising patterns in the prevalence, incidence and mortality related to CKD in various geographic areas, a factual indication of the demographic transitions, aging of the population and the increasing number of metabolic risk factors [2]. Besides the increasing prevalence, evaluations of the quality of healthcare services and disease burden indices associated with CKD indicate that there is significant disparity in the quality-of-care delivery and care outcomes between nations, which reveals the global inequities in the early detection and management of the disease [3].

Although there has been improvement in the treatment of nephrology, CKD is a progressive disease with a considerable amount of residual risk. It has been shown through landmark clinical trials that sodium–glucose cotransporter-2 (SGLT2) inhibitors like dapagliflozin have a significant effect in the reduction of renal and cardiovascular outcomes in patients with CKD [4]. Likewise, diabetes kidney disease has also been shown to respond positively to non-steroidal mineralocorticoids receptor antagonists like finerenone in postponing the onset of diabetic kidney disease [5]. Although such pharmacological advancements are significant advances in the field of renal therapy, most of the time the progression of the disease is merely slowed but not stopped, and renal dysfunction may still worsen in patients despite the optimal therapeutic regimen. The variability in response to treatment, affordability over a long period, and the ability to access treatment in resource-restricted conditions, as well as the persistent nature of cardiovascular comorbidities, continue to cause persistent clinical issues.

In addition to clinical consequences, CKD has a significant socioeconomic impact, both on an individual and an entire society. Economic evaluations of the CKD management research programme reveal that there are significant direct medical expenses of dealing with CKD ranging through spending on hospitalization, pharmacotherapy, dialysis and transplantation [6]. Microsimulation modelling research on project indicates that the financial burden of CKD will continue to grow in the coming decades, especially in those nations which will have an older population and rising cases of diabetes and high blood pressure [7]. Financial burden of end-stage kidney disease is especially high in low- and middle-income countries, where renal replacement therapy is still not commonly available and out-of-pocket costs are usually disastrous.

CKD is known to be one of the most common noncommunicable diseases common globally in epidemiological terms [8]. Extensive meta-analysis has given an estimate of the number of people affected by CKD to be 913 percent of the total adult population of the world, though there is a wide disparity in the prevalence of CKD across regions because of the variability in healthcare access, environmental exposures, and cardiometabolic risk profile [9]. Kidney disease has a wider implication on morbidity that is renal specific because CKD is a significant contributor to cardiovascular risk and overall mortality. Kidney disease is among the global health issues with a high correspondence with Sustainable Development Goals, specifically those that target noncommunicable diseases, health equity, and universal health coverage [10]. It is important to note that over 850 million people across the globe have been estimated to be living with kidney diseases highlighting the sheer scale and urgency of this health issue [11].

Parallel to biomedical advances has been an increasing appreciation of traditional and complementary medicine systems across the world with often much expectation of their role in chronic disease management. The World Health Organization recognizes that traditional and complementary medicine is widely used by a wide range of people and in various health care environments and it emphasizes the need to consider integrating evidence-based traditional practices in national health systems as well as safety and quality assurance of traditional medicine use. Integrative approaches can provide supportive mechanisms to help patients in such cases, which focus on enhancing the quality of life and comprehensive care of patients in chronic, multifactorial conditions like CKD, where long-term metabolic control, lifestyle change, and systemic homeostasis are paramount.

As the renal disease burden is increasing globally, the clinical and economic morbidity of CKD continues to be a persistent and significant issue and the current therapeutic modalities have not been effective in the face of new pharmacological breakthroughs, there is renewed enthusiasm that may be placed on complementary and integrative approaches. Ayurveda is one of the oldest systems of medicine ever codified, which conceptualizes health and disease based on the principles of systemic regulation that are based on metabolic balance, the nourishment of tissues and functional harmony. Given the chronicity and a multifactorial disease process of renal disorders, Ayurvedic views can offer conceptual understandings that can be applied in prevention, early-stage intervention and supportive management in an integrative approach.

Based on this, this narrative review will critically analyze Ayurvedic theories that pertain to kidney health, analyze the scientific evidence that currently exists that backing Ayurvedic therapeutic interventions, and speculate how integrative interventions can help in the management of renal disease in modern times. This review aims to instill into a disproportionate and evidence-based discussion of the topic of integrative approaches to renal care by bringing the classical theoretical constructs and the current biomedical knowledge closer to each other. The objectives of the study are:

1. To examine Ayurvedic concepts of kidney health in the context of modern renal pathophysiology.
2. To assess the efficacy, safety, and mechanistic evidence of Ayurvedic interventions in renal disorders.
3. To evaluate the feasibility of integrative and personalized renal care combining Ayurveda with conventional nephrology.

## **2. Burden and Pathophysiology of Renal Diseases**

Renal diseases represent one of the critical and growing worldwide communities of health, with a spectrum of chronic kidney illness (CKD) and end-stage renal illness (ESRD) to acute kidney disease (AKD) and acute kidney injury (AKI) [12]. Modern epidemiological evaluations show that kidney disease is a significant cause of morbidity, premature mortality and medical care use in regions, and ongoing disparities in kidney treatment abilities (screening, diagnosis, workforce and access to kidney replacement treatment), influence outcomes particularly in limited resource areas. There is also the issue of national surveillance, which illustrates how big of a problem is even in the countries with high resources; the annual report of the US Renal Data System 2023 proves a persistent burden of CKD and ESRD with significant downstream complications and expenses [13]. In addition to clinical outcomes, the financial cost is immense: the global cost assessments indicate that the direct medical spending increases enormously with the progressive CKD stage and it is enhanced by the prevalence of comorbidities, underlining the economic burden on patients and healthcare systems [14].

The acute kidney injury and the wider construct of AKD are now increasingly being acknowledged as significant contributors to renal morbidity in the long term as opposed to being occurring in isolated, completely reversible instances. Patterns of AKI/AKD are found to be broadly similar across a variety of geographic populations through the epidemiological harmonization process with consistent definitions, as an indication of standardized surveillance and benchmarking [15]. Notably, AKD is a transitional phase with prognosis importance following AKI, which often indicates the incompleteness of the recovery and puts an individual at a high risk of further CKD development and death. Recent epidemiological reviews emphasize on the burden of AKD and note that follow-up after acute occurrences is essential to detect cases of ongoing dysfunction and minimize the occurrence of another poor renal event that follows [16]. All of these data together are indicative of a trajectory model where acute renal insults can trigger or hasten chronic pathways leading to CKD and in some patients, ESRD.

The major etiological causative factors of CKD and ESRD in the world are diabetes mellitus and hypertension, often put together in metabolic syndrome. These circumstances favor renal damage by acting as a mixture of metabolic, vascular, and inflammatory outcomes, such as glomerular hyperfiltration in the initial phases of the ailment and microvascular malfunctioning in the long term. The existing evidence-based practice related to diabetes management in CKD encourages the development of combined approaches involving the management of glycemic control as well as kidney-specific risk reduction and cardiovascular protection due to the primary role of diabetes in the development and progression of CKD [17]. Simultaneously, international analyses of kidney health systems have suggested in the significance of prevention and early management of these risk factors that can be controlled to stop unnecessary development into these extreme cases of kidney failure.

Intersecting pathways such as oxidative stress, inflammation, fibrosis and hemodynamic changes promote the progression of renal disease at the mechanistic level. The presence of oxidative stress, which is usually increased by hyperglycemia, dyslipidemia and hypertension, facilitates endothelial dysfunction, tubular damage and poor microcirculation. Constant inflammatory stimulation maintains cytokine signaling and inflammatory cellular infiltration to shift tissue responses to maladaptive remodeling. Following AKI, the uncontrolled inflammation and faulty repair may lead to irreversible structural damage, which connects the acute and subsequent CKD development. Tubular atrophy and interstitial fibrosis are the result of fibrogenesis and extracellular matrix deposition, which is a terminal common pathway of irrevocable nephron loss. Hemodynamic impairment such as intraglomerular hypertension and autoregulation failure is an additional cause of glomerulosclerosis and filtration capacity degradation, especially in diabetic and hypertensive kidney disease, and is also a primary therapeutic objective.

The current management approaches have focused on early detection, prevention of progression of complications, and reduction of complications. The main strategies are to optimize blood pressure, personalized management of diabetes in CKD, reduce cardiovascular risks, avoidance of nephrotoxins, and follow-up of post-AKI/AKD to identify an incomplete recovery and prevent irreversible deterioration. True, despite progress, serious residual issues remain: delayed presentation of early CKD, disjointed transitions between care after acute kidney events, and huge disparities in dialysis and transplantation access, as well as soaring direct medical expenses of later-stage of the disease. These chasms support the necessity to have the integrated, longitudinal, and system-conscious models of renal care to include the biological factors of progression and the healthcare delivery obstacles that sustain poor outcomes.

### 3. Ayurvedic Conceptualization of Kidney Health

Ayurveda also has kidney health, which is perceived in terms of Vrikka and Mutravaha Srotas, which, combined, explain the structure and the functionality of the urinary system. Instead of viewing the kidney as a single organ, classical Ayurvedic belief places the control of urine in a larger system of channels taking care of fluid balance, waste removal and homeostasis of the system. The current-day reviews that address Ayurvedic management of chronic kidney disease (CKD) indicate that classical Ayurvedic preparation, like Punarnavadi Kwath, is based on such a structure of Mutravaha Srotas, on the importance of controlling fluid metabolism, removing the pathological burden, and restoring systemic balance [18]. This is manifested by the classical knowledge that renal dysfunction does not just originate by localized pathology but is more of a generalized disturbance in metabolic processing and integrity of channels. Table 1 is the summary of the major Ayurvedic theoretical constructs to kidney health comprising of Vrikka -Mutravaha Srotas, Tridosha regulation, Agni, Ama, and Dhatu-poshana and integrative interpretation in modern times.

**Table 1.** Key Ayurvedic Principles Underlying Kidney Health

<b>Ayurvedic Principle</b>	<b>Relevance to Kidney Health</b>	<b>Contemporary Interpretation</b>	<b>References</b>
Vrikka & Mutravaha Srotas	Governs urine formation, fluid balance, and waste elimination	System-level model of renal physiology and fluid homeostasis	[18]
Tridosha Regulation	Vata (flow), Pitta (metabolism), Kapha (structural stability)	Functional regulatory framework of physiological balance	[19]
Systems-Based Dosha Equilibrium	Dynamic balance maintains renal stability	Comparable to adaptive systems biology models	[20]
Agni (Metabolic Fire)	Maintains metabolic efficiency influencing renal function	Represents biochemical and metabolic regulation	[21]
Ama (Metabolic Toxins)	Causes channel obstruction and impaired urinary regulation	Parallels chronic inflammation and metabolic toxicity	[23]
Dhatu-poshana & Nutritional Personalization	Supports tissue nourishment and organ resilience	Reflects personalized metabolic and nutritional support	[22]

The Ayurvedic physiology is centred around Tridosha-Vata, Pitta and Kapha- which gives a functional explanation of all the biological processes including renal regulation. Vata controls movement and transport and is conceptualized as the dynamic of the aspects of filtration, circulation and urinary excretion. Pitta controls change and metabolism, which are the biochemical actions, which affect fluid balance and heat in the body. Kapha gives stability and lubrication to the structure and ensures integrity of tissues and fluid balance. Recent academic redefinition of the Tridosha paradigm indicates that this triadic framework can be interpreted as an initial control system that could incorporate various physiological variables in a consistent system [19]. Instead of being symbolic individually, Tridosha can be considered as outlining patterns of regulation, adaptation, and imbalance.

An interpretation more broadly developed by a systems-science approach suggests that Tridosha is like complex adaptive systems in biology, which are also known as complex systems. In this perspective a state of physiological stability is regarded as the dynamic equilibrium between regulatory forces and disease as the failure of their coordinated control [20]. With reference to renal health, this implies that the disorders in flow (Vata), metabolism (Pitta), or structure and retention (Kapha) may all lead to dysfunction of Mutravaha Srotas, alone or in combination. Ayurvedic renal physiology therefore is naturally integrative, and connects digestion, circulation, tissue metabolism and elimination under one theoretical framework.

Agni and Ama are other concepts that are fundamental in explaining the vulnerability of the kidneys. Agni is the digestive power and gastrointestinal and tissue metabolic power [21]. Agni is supposed to be properly functioning which guarantees full digestion, optimal nutrient assimilation, and normal conversion of tissues. The impairment of Agni causes an incomplete metabolism that results in the creation of Ama, which is a toxic, heavy, and obstructive substance that is defined in classics. Recent Ayurvedic nutritionomic studies indicate that metabolic maximization and long-term physiological balance can be best achieved through the dietary personalization based on constitution, which is a concept well-established in Ayurveda [22]. Modern interdisciplinary arguments which make comparisons between Ayurveda and biomedical science suggest that Ama can conceptually be analogous to chronic inflammatory mediators and metabolic waste materials that cause progressive organ damage [23]. Within kidney health, it is believed that Ama build-up blocks the channels and interferes with fluid regulation, thus predisposes to chronic disease conditions.

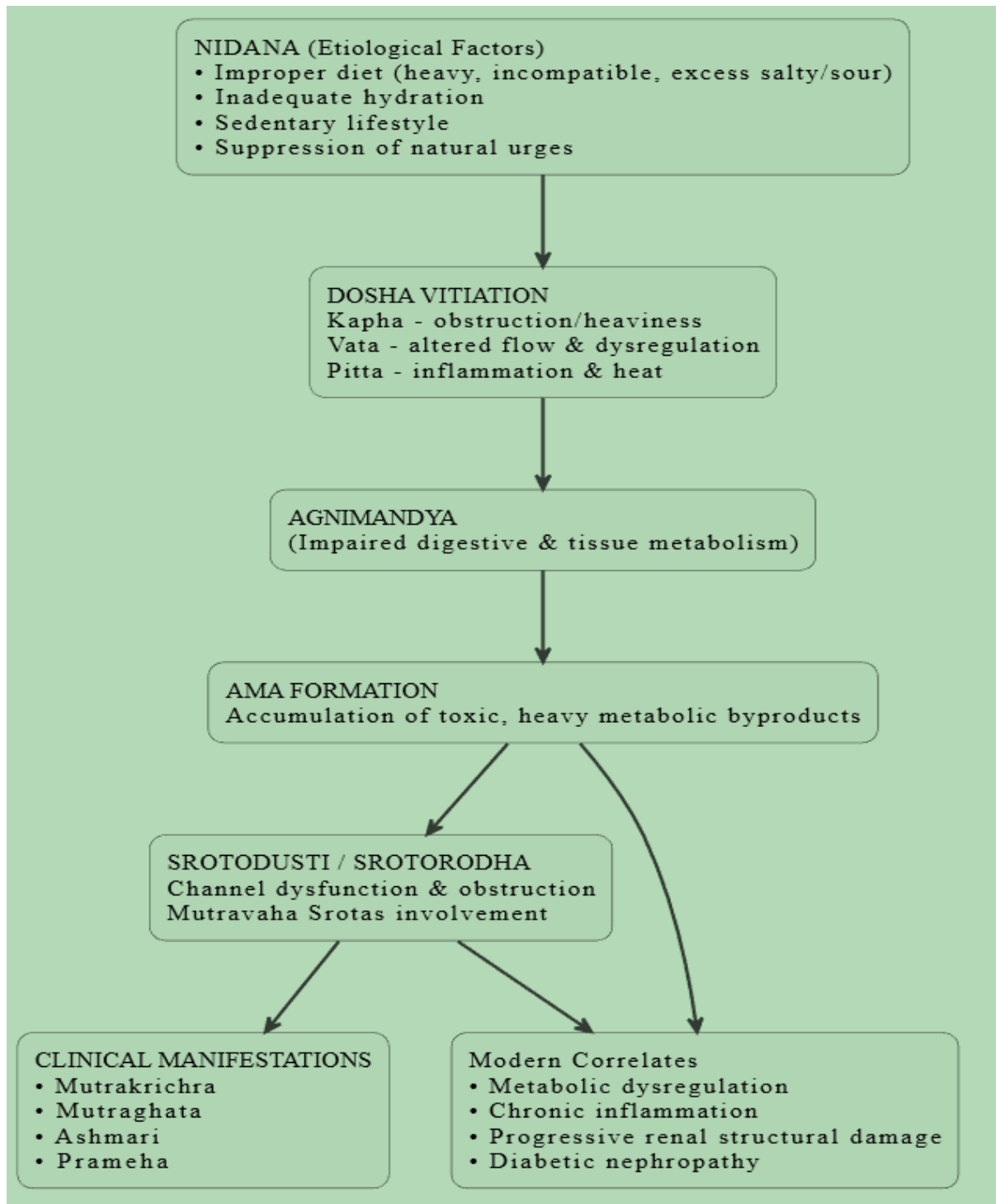
Ayurveda, in its turn, also insists on the necessity of Dhatu-poshana (subsequent tissue nourishment) and a general sense of vitality in the body to ensure the health of organs. The kidney, like any other organ, relies on proper nutrition of tissues by a systematic metabolism change. According to this method, it is clear that renal health is maintained not only by removing the wastes but also by proper nourishment, metabolic balance, and maintenance of adaptive ability.

All these ideas present the kidney health as a new product of the harmonious Dosha interaction, optimal metabolic fire, clear passages, and tissue perpetual activity. Modern integrative discourses suggest that this systems oriented model can be used to supplement contemporary biomedical approaches by focusing on personalization, prevention, and systemic control as opposed to the reductionist organ based models per se.

#### **4. Ayurvedic Pathogenesis of Renal Disorders**

Ayurvedic pathogenesis of renal diseases is described in a hierarchical sequence, starting with Nidana (etiological factors) and moving on to Dosha vitiation, impairment of Agni, Ama formation/accumulation, and eventually by Srotodusti with Srotorodha (channel obstruction) resulting in dysfunction of the Mutravaha Srotas, and clinical manifestations of the disease in the urine and kidneys [24]. Based on a modern integrative perspective, Ayurvedic sciences explain chronic illness as a dysregulation on a systems level whereby chronic internal stressors (metabolic imbalance, inappropriate diet, improved digestion metabolism, and unresolved inflammatory milieu) lead to progressive tissue damages, significant to note, contemporary cross-linkage dialogues identify chronic inflammation as an overlapping axis in most degenerative states, and suggests conceptual bridges between Ayurvedic constructs (Ama-centric pathology, long-term Dosha imbalance) and systems biology. In this reasoning, imbalance caused by kidneys is hardly ever local, but a continuation of systemic imbalances that eventually end up in urinary pathways, fluid homeostasis, and tissue maintenance of the renal parenchyma.

Some common Nidrana described in Ayurvedic clinical reasoning of involvement of the Mutravaha Srotas are excesses in the diet (excessively heavy, incompatible, overly salty/sour, processed or sedentary tendencies), insufficient hydration or irregular intakes, inhibition of natural urges and lifestyle factors that worsen Kapha and disrupt balances in metabolism. These exposures lead to a predisposition to Dosha prakopa and ultimately Dosha dushya sammurchana (combination of vitiated Dosha and susceptible tissues) which is majorly expressed when the Urinary system loses its functional clarity of the Mutravaha Srotas. Ayurvedic mechanistic In Ayurvedic mechanistic terms, a sustained Dosha-vitaka may result in Srotorodha, which causes a change in urine flow, pain, dysuria, retention, or frequent urinary discomfort. An explicit analytical study of the Ayurvedic idea of srotodusti, particularly in the context of urinary tract infections (and cystitis, in particular), provides a specific Ayurvedic disease-mechanism mapping, which can be utilized as a pathway to current symptom complexes, including recurrent UTIs and lower urinary tract inflammatory entities [25]. In such a way, Ayurvedic pathogenesis focuses on both the substrate (metabolic derangement and systemic load) and the site (channels of urine formation/flow) that is why recurrent or chronic urinary disorders are usually associated with some general dietary patterns and metabolic derangements.



**Figure 1.** Ayurvedic Pathogenesis of Renal Disorders

Figure 1 shows the Ayurvedic classical pathogenesis (Samprapti) of renal disorders that begins with the Nidana (etiological factors), followed by Dosha vitiation and Agnimandya (impaired digestive and tissue metabolism), and lastly Ama formation. The accumulating Ama causes Srotodusti and Srotorodha through the assistance of the Mutravaha Srotas lastly emerging as clinical conditions of Mutrakrichra, Mutraghata, Ashmari and Prameha. The clinical terms of the classical urinary disease entities are the conceptual similarity between the modern interpretations of metabolic dysregulation, chronic inflammation, progressive structural injury of the kidneys and diabetic nephropathy. Mutrakrichra (painful/difficult micturition) and Mutraghata (retention/suppression/obstructed flow) are pathological conditions that can take place because of Dosha imbalance and Srotorodha and Ashmari (urinary calculi) are more tangible predilections of obstruction which can be connected with long-term disturbed metabolism and malfunction of channels. Prameha is a broader group of metabolic disease where such a conceptualisation of renal disease as a secondary effect of long term metabolic imbalance is pertinent. In contemporary clinical research on Prameha purvaroopa (premonitory aspects), it has been suggested [26] that a potential use in Ayurvedic symptom-pattern recognition as an early risk-predictive model of subsequent diabetes is a systemic metabolic derangement, which in turn leads to overt disease. This is an important part of the renal pathogenesis as in the modern medicine Prameha is a vital upstream cause of chronic kidney damage Ayurveda

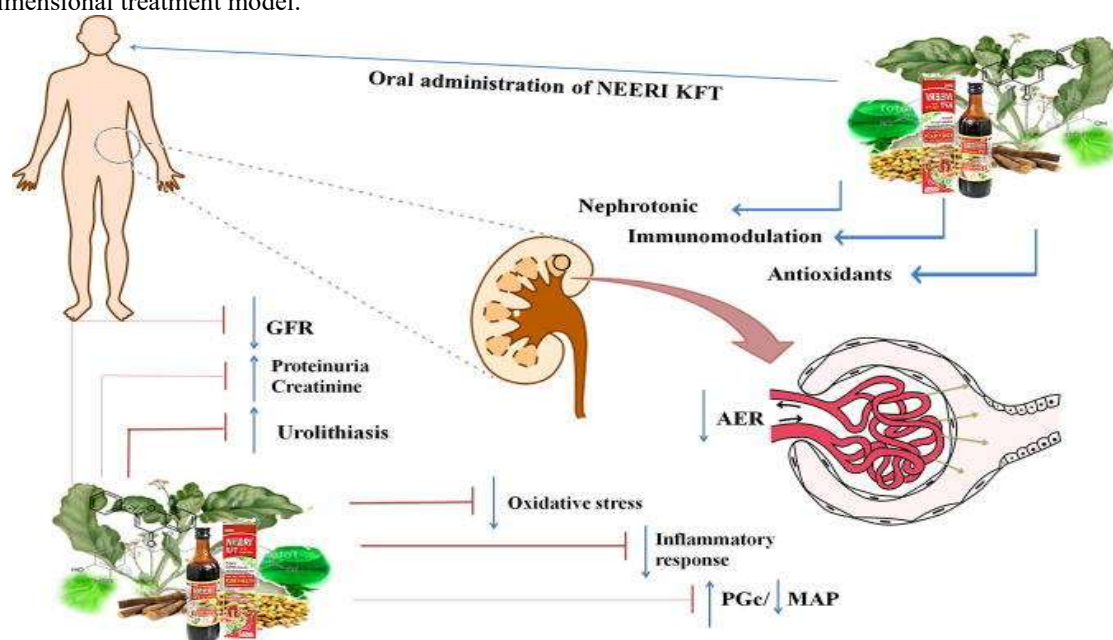
is also looking at Prameha as a whole-body disease with multifaceted effects on other organs like urinary/renal vulnerability.

The conceptual similarity of integrative Ayur-nutri-pharmaco to modern renal diseases are also being put across especially in diabetic renal disease. Recent integrative review studies of the situation of diabetic nephropathy contextualises dietary personalisation and drug-nutrition strategies with the Ayurvedic theory where the processes of renal injury development are implicitly associated with chronic metabolic pathophysiology and systemic inflammatory stress are overlapping symptoms of Ayurvedic pathways Aggni then Ama / inflammatory load then progressive tissue/channel malfunction [27]. Combined, these sources help to strengthen a coherent integrative process: Ayurvedic Nidra-based Dosha imbalance and Srotorodha can be considered along with current clustering of risks (metabolic syndrome/diabetes), chronic inflammation and progressive renal microvascular and tubular-interstitial damage. In practical terms, within the framework of a scholarly writing, this would allow you to present Ayurvedic pathogenesis as a structural explanatory model that would superimpose the modern pathways (metabolic dysregulation and chronic inflammation), and continue to have the classical types of disease (Mutrakrichra, Mutraghata, Ashmari, Prameha) as discrete Ayurvedic disease typologies.

## 5. Ayurvedic Therapeutic Principles and Interventions

The Ayurvedic curative therapy of kidney disorders is based on Chikitsa Siddhanta, where the treatment is customized based on the predominance of the Dosha, disease phases, patient strength and channel blockage. A clinical trial with support to formulation-based management to treat urinary disorders was reported in a randomized, placebo, and double-blind trial on an herbal formulation to treat renal calculi stating safety and efficacy after 28 weeks of treatment, which expressed application of classical therapeutic principles in organized clinical trials [28]. Such studies demonstrate how Ayurvedic interventions are used to treat the symptoms with correcting the underlying functional imbalance.

One of them is the Dosha-based management with medicines and regimens being chosen according to the requirements to pacify aggravated Vata, Pitta, or Kapha and restore the balance in the Mutravaha Srotas. Modern systematic assessment of nephron-protective AYUSH medicine especially those found in traditional polyherbal preparations like NEERI-KFT, identifies their anti-inflammatory, antioxidant, diuretic, and metabolic-modulating actions, which provides pharmacological counterparts to Dosha-oriented remedy in the treatment of chronic kidney disease [29]. The present reviews provide a rationale that polyherbal combinations act on various biological pathways, as per the classical multidimensional treatment model.



**Figure 2:** Proposed Mechanisms of Nephroprotective Action of NEERI-KFT in Renal Disorders  
Source: Adapted from [29]

The schematic view of the suggested nephroprotective effects of NEERI-KFT on oral administration was plotted in Figure 2 [29]. The formulation has multimodal therapeutic effects, such as the antioxidant, immunomodulatory, and nephrotonic effects. These effects are associated with the decreased oxidative stress and inflammatory levels in renal tissues, enhancement of glomerular filtration rate (GFR), and a decrease in proteinuria and serum creatinine. The figure also shows the reduced albumin excretion rate (AER) and the adjustment of the renal hemodynamic parameters, mean arterial pressure (MAP), and prostaglandin (PG) activity. Together with the mechanisms mentioned, *Boerhaavia diffusa* (Punarnava) and *Tinospora cordifolia* (Guduchi) are often mentioned among the most common medicinal plants in terms of their nephroprotective and immunomodulatory effect. Investigations involving experimental studies assessing a mixture of these herbs have shown protection against diclofenac-induced nephrotoxicity to give a mechanistic protection of traditional medicine use in supporting kidney tissue and also in modulating inflammation [30]. These results enhance the connection between the old understanding of botany and modern pharmacology.

Pathaya-Apathya is the dietary and lifestyle control that is still regarded as the main Ayurvedic control of the kidneys. Dietary discipline, control of the fluid intake, intolerance of heavy or incompatible foods and preservation of the efficiency

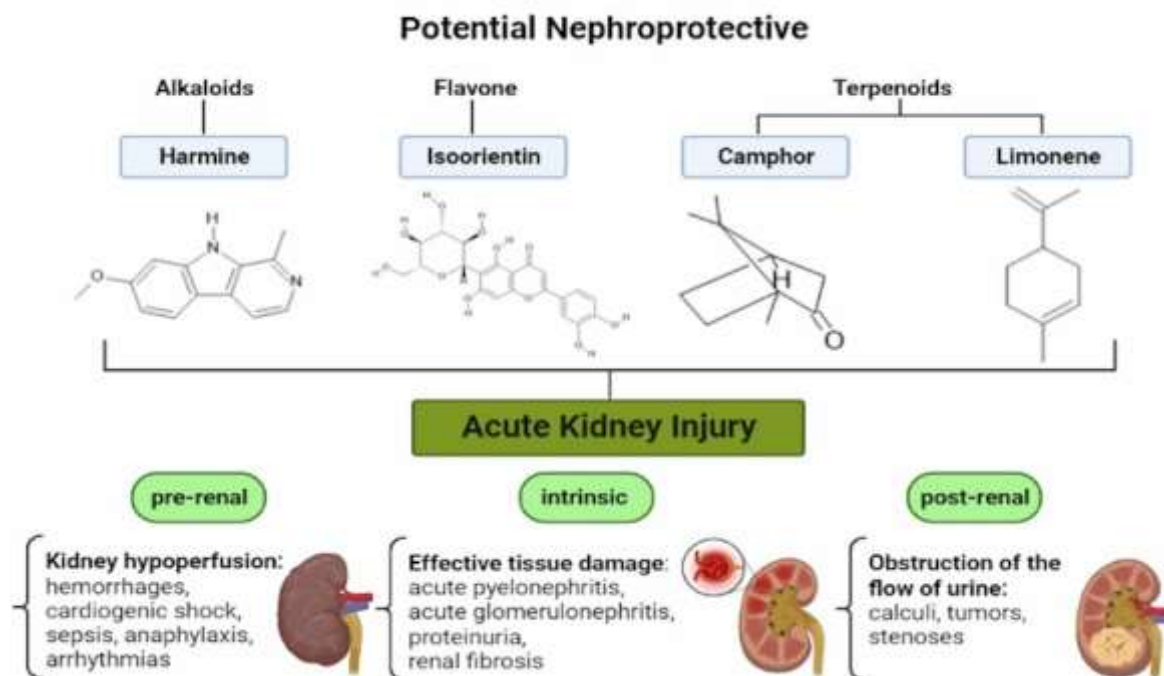
of the digestive system are considered to avoid the aggravation of the Dosha and additional blockage of the channels. A dedicated analysis of Pathya-Apathya highlights that adherence to diets improves the result of therapy and promotes the systemic metabolic equilibrium, which justifies the factor as a non-pharmacological foundation of treatment [31]. This is explained into meticulous nutritional counseling in renal disorders to reduce the metabolic load and promote urinary efficiency.

At last, Ayurvedic kidney care incorporates revitalizing and supportive methods, especially with long-term illnesses. The objective of Rasayana-oriented strategies is to strengthen the tissue and lessen oxidative stress as well as maintain organ vitality. Evidence supporting many botanical agents as antioxidants, anti-fibrotics and nephroprotectants, is collected in a comprehensive survey of Ayurvedic medicinal plants in chronic kidney disease, describing the rejuvenative and restorative aspect of Ayurvedic medicines [32]. Among them, these interventions demonstrate an integrative approach that also includes the integration of Dosha correction, botanical therapy, diet-lifestyle discipline, and tissue-supportive measures as a means of treating renal disorders in an informal and individualized way.

## 6. Pharmacological and Clinical Evidence on Ayurvedic Interventions

Ayurvedic interventions in renal disorders have pharmacological and clinical support that is slowly developing comprising systematic reviews, experimental nephroprotection, safety, and pharmacovigilance studies. The systematic review of herbal candidates in chronic kidney disease (CKD) shows that there are numerous botanicals used traditionally in Ayurveda which show potential renoprotective effects in experimental and small clinical trials [33]. These candidates often have been linked to antioxidant, anti-inflammatory and cytoprotective activities, which have provided biological plausibility to the adjunctive use of these in CKD treatment. Nevertheless, the absence of homogeneity in the formulations, dosages, study design, and outcome measures is a significant drawback of the synthesis of conclusive therapeutic findings.

Mechanic assistance of nephroprotection is supported in preclinical models. The protective effect of *Boerhaavia diffusa*, a widely used Ayurvedic herb, in gentamicin-induced acute nephrotoxicity was also shown by experimental studies conducted on murine models showing the enhancement of the biochemical parameters and the reduction of the histopathological changes of the victim. These results are consistent with the general phytopharmacological data reported that most Ayurvedic botanicals have renoprotective actions by suppressing oxidative stress, regulating inflammatory cytokines, and maintaining renal tissue structure. These are the mechanistic mechanisms of antioxidant scavenging, stopping pro-inflammatory cytokines, and, potentially, antifibrotic signaling regulating, applicable to the pathophysiology of CKD and diabetic nephropathy. Potential nephroprotective phytochemicals targeting different mechanisms of acute kidney injury are illustrated in Figure 3.



**Figure 3.** Potential Nephroprotective Phytochemicals and Their Role in Acute Kidney Injury

Source: Adapted from [34]

Though a good pharmacodynamic profile is likely, the safety concerns take the first priority, particularly in the frail renal patients. Kidney disease patients use herbal supplements often and a significant part of the clinical analysis has been conducted to demonstrate the high possibility of such interactions between the user of the herb and the drug in the antihypertensives, antidiabetics or immunosuppressive treatment [35]. The decrease in renal clearance also disposes one to the accumulation toxicity. In this way, Ayurvedic interventions in the process of nephrology require introducing systematic medication reconciliation and monitoring.

The modern safety screening methods will assist in the current toxicological measures to identify the risk of nephrotoxicity, as well as detail dose-related toxicity profiles by botanicals [36]. This is particularly important because CKD patients may also have an alteration in their pharmacokinetics and be prone to nephrotoxic drugs. To complement the toxicological analysis, pharmacovigilance reviews aim to refer to the fact that adverse event and nephrotoxic herbal drugs should be systematically reported and monitored worldwide [37]. One of the largest problems as far as effective estimation of risk is concerned is underreporting and incomplete documentation.

The quality control issues also complicate the issue of the clinical climate. Analytical works that establish the existence of heavy metal in certain Ayurvedic herbal preparations have shown quantifiable amounts of metals that are cause of concern in terms of chronicity and also in terms of cumulative toxicity [38]. Given that the kidney functioning may be compromised and therefore result in the excretion of heavy-metals being lower, low-level contamination may be of great concern in safety regard. Other professional statements have brought up the query that some Ayurvedic medicines may possess undesired sources of heavy metals provided the manufacturing and sourcing standards are not closely obeyed [39]. These findings reveal the necessity of the quality control, sourcing of raw materials in a standardized way, developed manufacturing processes, and regulating the authority.

In total, all the pieces of evidence presented allow the idea that the Ayurvedic botanicals possess the biologically plausible nephroprotective effect with the experimental evidence and systematic reviews [40]. The data offered by mechanistic clues is devoted to the antioxidant and anti-inflammatory processes that are applicable to the development of CKD. However, the level of scale and methodological effectiveness of clinical evidence is still wanting, and such a problem as the safety of the herbs, their interaction with drugs, the risk of nephrotoxicity, pharmacovigilance failure, or contamination must be considered. The reserved and integrative approach can therefore be justified with the help of critical appraisal: Ayurvedic interventions can be incorporated as added protocols in evidence-based, multidisciplinary renal care provided that safety protocols, quality assurance and joint clinical supervision are prioritized.

## 7. Integrative Approaches in Renal Disease Management

Integrative medicine in relation to the management of renal diseases aims at integrating the conventional nephrology with complementary systems like Ayurveda in a coordinated patient centered approach. The chronic kidney disease (CKD) is the complex and progressive disease that may be caused by the metabolic, inflammatory, cardiovascular, and lifestyle determinants[41]. Although standard nephrology offers effective evidence-based guidelines to diagnose, stage and treat with pharmacological therapies, numerous patients consider alternative approaches to enhance symptomatic control, quality of life and well being. A review paper exploring the place of alternative medical systems in adult CKD patients has shown that the use of complementary therapy is prevalent, and in most instances it is supplemental and not a replacement to conventional care [42]. This highlights the usefulness of organized integrative care models that foster transparency, safety and coordinated decision-making in practice.

The Ayurveda plus traditional nephrology is explained by the complementary advantages. The global CKD management guidelines focus on early identification, risk stratification, blood-pressure and glycemic therapy, dietary treatment and reduction of the cardiovascular risk to delay the development phase of the disease and enhance the results [43]. These biomedical priorities are the ones that are in line with Ayurvedic focus in part on metabolic correction at early age, on dietary control, and on lifestyle discipline. The Ayurvedic emphasis on Agni (metabolic balance), Agni avoiding Ama, and Agni maintaining equilibrium in the human system can be conceptually relevant to the prevention in the initial stages of CKD or the at-risk population. Combined in a responsible manner, Ayurvedic lifestyle and food tenets can serve as an addition to guideline-based care instead of being in opposition to it. Table 2 demonstrates that integrative renal disease management includes the use of complementary therapy, the use of guidelines in nephrology, the perspectives of personalized medicine, and multidisciplinary collaboration.

**Table 2.** Core Domains of Integrative Renal Disease Management

<b>Integrative Domain</b>	<b>Key Considerations in Renal Care</b>	<b>Reference</b>
Complementary Therapy Utilization	High prevalence of alternative medicine use among CKD patients necessitating coordinated and transparent care models	[42]
Conventional Nephrology Foundation	Emphasis on early detection, staging, blood pressure and glycemic control, and cardiovascular risk reduction	[43]
Prevention and Early-Stage Management	Lifestyle modification and metabolic regulation as supportive strategies in early CKD	[43]
Personalized Medicine (Prakriti Profiling)	Constitutional assessment to guide individualized preventive and supportive interventions	[41]
Multidisciplinary and Collaborative Care	Integrated care involving nephrologists, nurses, dietitians, pharmacists, and traditional medicine practitioners	[44]

The application of integrative care can be especially applicable in the case of early-stage disease, where the most effect can be achieved by means of preventive and lifestyle-focused approaches. Traditional nephrology accepts the fact that early diagnosis and management of stages 1-3 CKD can slow down the progression and decrease the complications. Ayurveda, in its turn, focuses on the prompt identification of imbalance and its remedies, which are achieved through the change in the form of food, behavioral control, and interventions that are relevant to the constitution. This can help improve patient engagement and compliance especially where they appeal to cultural health beliefs. Integration should

however not postpone or substitute any pharmacotherapy or renal replacement planning at late stages of disease progression.

Ayurveda can also play a role in integrative renal care in another area, namely personalized medicine. The Ayurvedic theory of Prakriti (constitutional typology) suggests a constitutional predisposition of physiological and metabolic tendencies of individuals affecting susceptibility to disease and response to treatment. Another critical study conducted recently to assess Prakriti instruments demonstrates that attempts are still being made to standardize constitutional profiling and examine the scientific legitimacy of the assessment instrument. Though additional confirmation is needed, constitutional stratification is similar to current precision medicine models which aim to prevent and treat individuals based on their risk-based profiles. Constitutional information, with the well-known risk models, may be useful in CKD management to supplement dietary recommendations, lifestyle change, and supportive interventions to individuals.

The key to CKD management is collaborative and multidisciplinary care models. It has been proven that interdisciplinary care approaches such as the collaboration of nephrologists, nurses, dietitians, pharmacists, and other workers, leads to better clinical outcomes, compliance, and patient satisfaction among the CKD populations [44]. Those models might be extended by integrative renal care which may incorporate qualified traditional medicine practitioners through the organized lines of communication. This would make sure that the complementary therapies are revealed, recorded and followed up on their safety especially about possible herb-drug interactions or clearance issues. Teamwork among professionals is also necessary in order to prevent the existence of fragments of care and to remain aligned to clinical guidelines.

Notably, integrative approaches should not be out of the laid down standards of nephrology. The KDIGO clinical practice guideline offers an elaborate guideline on the assessment and management of CKD, including staging, risk assessment, and the target of the therapeutic treatment. Integrative care must fit into this model, and it must not be used to substitute evidence-based biomedical treatment. Open patient education, decision-making, and continuous monitoring are essential to guarantee patient safety and optimal outcomes.

To conclude, integrative management of renal diseases is a model that brings together biomedical rigor and holistic and personalized views. The need of patients in complementary therapies, preventive measures based on guidelines, new personalised models like Prakriti profiling and evidence in favour of multidisciplinary approach jointly contribute to the creation of structured, collaborative, and safety-focused integrative nephrology models. Applied in a responsible way, these practices can potentially improve patient involvement, preventive treatment, and overall well-being without harming the compliance with the accepted renal medicine standards.

## 8. CONCLUSION

Renal diseases are a world epidemic that is associated with complex pathophysiology, progressive impairment of functions, and high levels of socioeconomic costs. This review indicates that Ayurveda is a holistic and systems-based approach to understand kidney health and kidney disease using a variety of concepts, including; Vrikka, Mutravaha Srotas and Tridosha regulation, Agni, Ama and Dhatu-poshana. In contrast to reductionist organ-based models, Ayurvedic theory has a conceptual framework in understanding renal dysfunction as a consequence of systemic metabolic imbalance, obstruction of channels, and chronic inflammatory conditions, which offers an integrated interpretation of interesting modern perspectives on oxidative stress, fibrosis and metabolic dysregulation. There is pharmacological and preclinical evidence that a number of Ayurveda botanicals have potentials of nephroprotection when used by antioxidant, anti-inflammatory and cytoprotective actions. There is emerging clinical evidence that it has potential advantages in chronic kidney disease, diabetic nephropathy and nephrolithiasis, but the issues of methodology and heterogeneity are indicative that further, better-designed randomized controlled trials are necessary. The safety issues, such as herb-drug interactions, gaps in pharmacovigilance, and quality control issues, such as all-too-much-contamination by heavy metals, have to be kept in the focus of integrative application. Models of integrative renal care that combine Ayurvedic preventive and personalized with standard nephrology models can provide some complementary value, especially at early disease stages, and in supportive care. Multidisciplinary interventions comprising constitutional profiling and lifestyle-based interventions can help to improve patient engagement and adherence.

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