

CHRONIC KIDNEY DISEASE(CKD) PATHOGENESIS IN AYURVEDA PARLANCE- A REVIEW!

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ABSTRACT

Chronic Kidney Disease (CKD) is a progressive disorder involving declining kidney functions over years. The disorder is associated with a broad spectrum of presenting features, including breathlessness, oedema, nausea, loss of appetite, weight loss, etc. CKD is highly prevalent worldwide. The solution of choice for CKD is either kidney transplantation or blood purification treatments such as haemodialysis (HD). Such medical procedure involves an arduous journey for the patients. Hence, such patients often resort to alternative medicines to improve their quality of life. *Ayurveda* treatment modality not only offers a good solution for the same, providing parallel support to HD patients, thereby improving their quality of life, but in some instances, it depicts auspicious results, thereby substituting the official medicine. *Ayurveda* caters to its vital principles, as they play a pivotal role in electing the treatment, hence an in-detail study to find the *Dosha*(biological humour), *Dushya* (affected tissues), *Strotas*(circulatory channels) etc., involved in the manifestation and progression of the disease, thereby formulating its pathogenesis is utmost essential because proficiently practised *Ayurveda* modality complying its basic concepts is capable of definitely yielding reliable & optimal results when applied for disease management.

Key words: CKD, Chronic Kidney Disease, Pathogenesis, *Samprapti*.

INTRODUCTION

Chronic Kidney Disease (CKD) is a progressive condition affecting millions worldwide. It is a long-term condition characterized by gradual loss of kidney

function over time. CKD is a progressive loss of renal function over three months or more; once the kidneys are damaged, they cannot filter blood and perform

other activities. This is generally associated with a decline in glomerular filtration rate (GFR) and proteinuria.^{1, 2, 3} chronic kidney disease (CKD) has become one of the most protrusive causes of death and suffering in the 21st century. It is, therefore, paramount that CKD is timely identified and monitored, such that its preventative and therapeutic measures are systematically implemented worldwide.⁴ Despite the significant progresses observed in contemporary science, the approach for treating kidney patients still need improvement. Ayurveda, the traditional system of medicine known for millennia, is highly esteemed throughout the globe as a therapeutic regimen for the prevention of various diseases.⁵ To treat the disease with *Ayurveda* modality, one must understand it in *Ayurveda* parlance. *Ayurveda* expounds a broad spectrum of contemporary science and includes most of the diseases of modern times under its umbrella. Nevertheless, a few complex diseases exist and do not bear any direct references in *Ayurveda* terminology. CKD is one such disease, which needs to be understood on behalf of *Nidan*(aetiology) and *Lakshan*(signs and symptoms) to propose a *Samprapti* (pathogenesis) to adopt congruous treatment for the same. Hence, in this study *Ayurveda* prospective is thoroughly studied regarding the genesis of *Vrikk*(kidney), *Mutra Nirman Pravartan* (urine formation & excretion), involved *Doshas*(biological humour), *Dhatu*(tissues), *Mahabhoota*(five outstanding elements), *Srotas* (circulatory channels), *Srotodushti*(vitiating channels) *Hetusevana* (aetiological factors) & *Lakshana* (signs & symptoms)so as to understand the etiopathogenesis involved in CKD, which can be further utilised for disease management.

Material and methods

Ayurveda classics were reviewed thoroughly to find the *Dosha Dushya, etc.*, involved in the manifestation and progression of the disease, thereby formulating its pathogenesis conferring *Ayurveda* modality. Various published review articles and research papers from the internet have been thoroughly reviewed for the same.

Results & Observations

Kidneys are vital organs that cleanse our blood, affecting many bodily functions. Various medical conditions tend to retard the proper functioning of kidneys. Older age, low birth weight, family history of kidney disease, smoking, obesity, hypertension, and diabetes mellitus contribute as risk factors for the disease manifestation.⁶ The disease is often asymptomatic and manifests silently. It is detected when complications arise, with the advancing disease, the body can't get rid of enough fluids and metabolic waste products, thereby depicting symptoms of swelling, nausea, vomiting, diarrhoea, loss of appetite, weight loss, and itchy and pale skin, tiredness, weakness, shortness of breath, difficulties in concentration, confusion, muscle paralysis, muscle cramps etc.⁷ Signs and symptoms occur in diseased condition either due to the over functioning of one *Dosha* or due to the masked functioning of *Doshas* or as a result of internal interactions such as the formation of *Ama*(toxic products) etc. With the help of these basic principles, we can enter into the intricacies of chronic kidney disease. Chronic kidney disease, the term itself indicates long-term involvement of the kidney, thereby depicting more than one symptom and multi-system involvement along with kidney dysfunction. In *Ayurveda*, there is no direct description of CKD; the disease condition is not compiled in *Ayurveda* as such, its symptoms have been described in fragments as symptoms of separate diseases. *Charaka* had propounded the fact that every disease could not be named so the diseased condition could be understood based on the involved *Doshas, Dhatus, Srotas, etc.*⁸ As per modern description, the pathophysiological mechanism involved in CKD is indicative of multifactorial aetiology, corresponding to which thorough searching was done through the classics and various alternatives were postulated to understand the *Samprapti* of CKD. Based on its symptoms, such as Oliguria, decreased Glomerular Filtration Rate (GFR), hyperuricemia, etc., *Ayurveda* management of CKD can be done on the lines of treatment of *Mutravaha Srotasa Vikara*. (disorders of the urinary system). Its causes are intake of drinks and food, sexual inter-

course while one is having the urge for micturition, and suppression of the natural urge of micturition in especially those suffering from wasting or malnutrition and severe traumatic injury. Aetiological factors of CKD may range among the following diseases- *Paandu*(anaemia), *Shotha*(inflammation), *Parmeha* (urinary disorders), *Ashmari* (*renal calculi*), *Kshatksheena* (emaciation), *Vaatvyadhi* (diseases due to vata dosha), *Mutrakrichchra*(dysuria) etc. Pathogenesis:¹⁰ can be described as the kidney and bladder being the roots of the channels carrying urine, and the vitiated *Doshas*, while coming in contact with these channels, obstruct them, resulting in kidney disease. Which may be further expressed as:

- ✓ **Dosha:** *Tridoshas* (three humours: *Vata*, *Pitta*, and *Kapha*), with a predominance of *Vata dosha*
- ✓ **Agni:** *Agnimandya* (weak digestive fire)
- ✓ **Marga:** *Madhyam rogamarga*.
- ✓ **Srotas:** *Medovaha*, *Mootravaha*(fat & urine carrying channels)
- ✓ **Strotodushti:** *Srotosanga* (obstruction in micro-channels of *Mutravaha srotas*) and *Vimarga gaman* (following altered routes).
- ✓ **Adhishtan:** *Basti*(urinary bladder)
- ✓ **Vyadhi swabhava:** *Chirkari*(chronic)

Ancient seers include 4 types of *Ashmari* (calculi and urinary lithiasis), 13 types of *Mutraghata* (obstructive and suppressive uropathies), 8 types of *Mutrakrichha* (dysuria), and 20 types of *Prameha* (~metabolic disease) in *Mutravikara* (~disorders of the urinary system). Hence, its pathogenesis can include the pathogenesis of *Prameha*, *Mutra dosha* (urinary disease), *Mutrakrichchra*, *Ashmari*, etc. The signs & symptoms of *Mootra vikar* (a disorder of the urinary system) depict its clinical manifestations as voiding too much urine or complete cessation of urine, impaired urine composition, and passage of thick urine associated with pain.¹¹ Based on involved causative factors and its involved stages, CKD depicts various presentations and aggravated degrees of different signs and symptoms. Many of the signs and symptoms present in CKD are similar to the symptoms of *Rasapradoshaja Vyaadhi* (disease occurring due to vitia-

tion of *rasa dhatu*), *Mutrakshaya*, *Mutrasada* (described under 12 types of *Mutraghata*). *Rasapradoshaja Vyaadhi* represents signs and symptoms such as loss of desire for food, anorexia, distaste in mouth, loss of taste sensation, nausea, heaviness, drowsiness, body ache, fever with malaise, fainting, anaemia, feeling of darkness, paleness, obstruction in channels, impotence, malaise, asthenia, emaciation, loss of digestive power, untimely wrinkles and grey hairs.¹² *Acharya Sushruta* describes 12 types of *Mutraghata*(disorders of the urinary system) namely, *Vata-kundalini*, *Asthila*, *Vata-basti*, *Mutratita*, *Mutra Jathara*, *Mutrasanga*, *MutraKshaya*, *Mutra-granthi*, *Usna-vata* and *Mutrasada* etc.¹³ CKD depicts its presentation similar to *Mutrakshaya*, *Mutrasada*. *Mutrakshaya* occurs due to the deranged and aggravated *Pitta* and *Vayu*(biological humours) in the bladder of a highly fatigued *Ruksha* and *Klanta* (rough and exhausted) person, finding the lodgement in the bladder, leading to decreased urinary output accompanied by pain and burning sensation.¹⁴ On the contrary, *Mutrasada* manifestation occurs due to *Pitta* or *Kapha* vitiation in the bladder, leading to yellow colour urine with burning or white slimy urine production.¹⁵ Two kinds of presentations are seen in *Mutrasada*: either a non-slimy and thick flow, yellow-coloured urine accompanied with a burning sensation and leaving a yellowish sediment when dried or passage of slimy, stale and white coloured urine depicting pale sediments resembling the powder of conch-shell when the urine is dried.

DISCUSSION

Acharya Charaka has established that diseases are innumerable¹⁶, depending on immediate causes (*Dhatus* afflicted signs & symptoms), distant causes (like improper diet & regimen) and permutation and combination of various fractions of involved *Doshas*. *Tridoshas* denote the bodily vital functions, classified as *Vata*, *Pitta* and *Kapha*. The equilibrium of *Doshas* caters to health, whereas their derangement leads to disease. In *Ayurveda*, all diseases are described according to *Dosha*, *Dushya*, *Srotas*, etc involved in disease manifestation. Any disease caused by *Dosha*

Vaishamyata (imbalance of *Doshas*) is directly connected to symptoms, as a permanent relationship is adhered between *Doshic* involvement and *Lakshanas* encountered. For instance, vitiated *Vata* involved in CKD will always express through any of its *Lakshanas* like *Shoola*(pain), *Rukshatwa*(dryness), *laghava*(lightness) etc.¹⁷. In *Ayurveda*, Chronic Kidney disease bear's no direct reference; hence, to understand the disease which belongs to *Mutravaha sansthana* (renal system), kidney and its functions are studied by the *Ayurveda* parlance. *Classics* opine genesis of kidney and bladder (*Vrikka* and *Basti*) as *Matraj*(maternal) organs.^{18,19} Kidneys are constituted from the essence of *Rakta and Meda dhatu* (blood & fat tissue)²⁰ & facilitates removal of waste in the form of urine formation & excretion.^{21,22} *Hetu sevān* (intake of cause) leads to vitiation of *Srotas* (circulatory channels). The *Srotas*, having their roots either in *Vrikka or Basti*, involved in the formation & removal of waste, must be engaged in CKD pathology. These are summarised as:

✓ ***Medovaha Srotas***

It has its seat in *Vrikka*²³, therefore involved in genesis of diseases related to the kidneys. Daytime sleeping, consumption of fatty food, alcoholic drinks, and excessive exercise cause its vitiation, thereby depicting disease manifestations such as *Prameha purvarupa* (obstinate urinary disorders including diabetes mellitus).

Scientifically, it is well evident that too much indulgence in physical exercise or strenuous sporting activities can increase blood creatinine kinase (CK) levels.²⁴ Functions of kidneys are retarded owing to which they cannot filter blood; it leads to raised blood urea levels, which may prevent the pancreas from making insulin, thereby affecting blood glucose levels.²⁵ Therefore Diabetes is seen as a widespread CKD manifestation whereas *Ayurveda* principles recognise *Medovahasrotas* involvement for manifestation of *Prameha* in CKD.

✓ ***Mutravaha Srotas*** originating from *Mutrashaya and Vankashana*.²⁶ get aggravated by intake of food or drinks & having sexual intercourse while having the urge for micturition, suppressing

natural urges of micturition.²⁷ thereby depicting characteristic manifestations as *Bahumutrata*(voiding too much urine), *Alpamutrata*(suppression of urine), *Mutra avarodha*(obstruction of urine), *Burning micturition*, changes in *Mutra Gandha & Varna* (impairment of urine composition and colour) and passage of thick urine associated with pain.²⁸ Altered urine frequency composition, dysuria etc. are characteristic of CKD depicting *Mutravaha Srotas* involvement.

✓ ***Purishavaha Srotas*** Originating from *pakawakshaya and guda*.²⁹ gets vitiated by suppression of urge of defecation, intake of food in large quantity, intake of food before digestion of previous meal, especially in those who are emaciated or possess weak digestion,³⁰ thereby depicting characteristic manifestations as *Krichena alpam* (voiding small quantity of faeces with difficulty) *Shashoola, shashabda, Atidrava Atigrathita, Pravartana*. (voiding large quantity of watery faeces with sound and pain).³¹ Symptoms involving lower gastrointestinal tract occurring in CKD patients often include constipation and diarrhea,³² supporting the fact of involvement of *Purishvaha srotasa*.

✓ ***Swedavaha Srotas***: originating from *meda and lomakupa*.³³ gets vitiated due to excessive exercise, exposure to excessive heat, indulgence in hot and cold things without following prescribed order, anger, grief, fear. thereby depicting *Dushti lakshana* (characteristic manifestations) as *Atisvednam* (excessive perspiration), *Asvednam* (absence of perspiration), *Parushyam* (rough) or *Atishlakshanangasya* (excessive smooth body) and *Daha* (burning sensation).³⁴ Skin of a CKD patient is often dry, rough, may depict pruritis³⁵. Skin often presents yellow discoloration due to raised urea content in the sweat and even depicts deposition of powdery 'uremic frost'.

Clinical manifestations observed in CKD patient can be broadly classified as primary (renal) uremic manifestations and secondary (systemic or extra-renal) uremic manifestations. Owing to slow and progressive deterioration of renal function, there occurs imbalances leading to metabolic acidosis, excessive hydrogen ions and declination in bicarbonate levels de-

picting clinical symptoms of Kussmaul breathing, hyperkalemia and hyper calcaemia. Hyperkalemia further leads to excessive accumulation of potassium in the blood depicting clinical manifestations such as cardiac arrhythmia, weakness, nausea, intestinal colic, diarrhoea, muscular irritability and flaccid paralysis. With declined GFR levels, there occurs insufficiency of sodium & water to pass through the Bowman's capsule leading to its retention. With declining GFR there occurs excessive accumulation of uric acid in the blood, leading to uric acid crystals deposition in joints and soft tissues resulting in gout. The *Dushit Kleda* and *Vata* results in *Vata rakta* (gout) further depicting signs and symptoms of oedema, coppery skin discolouration, tingling sensation, itching & sloughing.³⁶ Secondary uremic (extra-renal) manifestations are also seen such as anaemia owing to reduced production of erythropoietin factor by the diseased kidney. Systemic involvement is seen such as fluid retention, secondarily manifesting cardiovascular symptoms owing to the increased workload on the heart due to the hypervolemia and eventually leading to congestive heart failure. Hypervolemia and heart failure further progresses to pulmonary congestion and pulmonary oedema owing to back pressure. Azotaemia induces gastrointestinal involvement. Osteomalacia manifests owing to vitamin D deficiency which is activated by the kidney and is essential for the absorption of calcium and its deficiency may even result in inadequate deposits of calcium in bone tissue. These presentations are very much similar to signs & symptom depicted in *Raspradoshaj vyadhi*, *Mutrāsada* (a type of urinary disorder), *Mutrakshaya* (a type of urinary disorder), *Pandu* (anaemia) *Shotha* (oedema), *Kshaya* (emaciation) etc as per *Ayurveda* modality.

Suspected *vyadhi ghatak* (components involved in disease manifestation) in terms of *Dosha*, *Dhatu*, *Agni* etc may be summarized as, the *Kapha* and *Vata dosha* (The bodily humours) are the main *Doshas* responsible for pathogenesis of CKD. These get vitiated causing *Srotorodha* (blocking circulatory channels) and eventually leads to *Vatavaigunya* (disrupting the function of *Vata* humour) further disrupting

the function of *Apana vayu* (governing elimination of urine, stool, flatus etc.), thereby interfering with urine excretion. *Medadhātu*. (fat tissues) is primarily involved *Dushya* (factor influenced by *Doshas*). According to *Ayurveda*, *Kapha* is seated in *Meda* and these possess similar properties. On the basis of *Ashraya ashrayee bhava* (interdependency), vitiation of *Kapha* also leads to vitiation of above *Dushya* (affected tissue) In this way, vitiation of *Kapha* also leads to vitiation of *Meda dhatu*. *Saraktā Meda* (Su.Sa. Sha.4) (*Meda* present in small bones) is mentioned as bone marrow in commentary by Vaidya Ranjith Rai Desai, further explaining the production of red blood cells by it. Hence *Saraktā Meda* in particular can be considered as a *Dushya* in CKD pathology thereby responsible for the manifestation of anaemia as complication in CKD. *Agni* plays a crucial role in disease manifestation. *Sushruta* opines that *Pitta* in the body is commonly called as *Antaragni*, since it performs *Dahana*, *Pachana* etc.³⁷ Out of thirteen different types of *Agni*, *Kayagni* is mainly responsible for the maintenance of normal physiological activities in the body. Its impairment leads to *Srotovaigunya* (the impairment of the functional integrity of the *srotas*), further disabling it to perform its normal functions. The *Abhojanam* (absence of food intake) *Ajeerna* (indigestion), *Atibhojana* (excessive intake of food), *Vishmashna* (ingestion of food before digestion of previous meal), *Asatmya* (incompatible food) *Guru* (heavy), *Sheet* (cold), *Rooksha* (dry) *Bhojana* (food) are the root causes leading to disturbances of *Agni*. The *Dushitagni* (impaired digestive fire) is unable to digest even the *Laghuhara* (light food) and disturbed *Pachana* (digestion) produces *Shuktatva* (fermentation) to *Ahara* (food) forming *Aharvisha* (food poisoning). The portion leads to *Mutrsanga* (urine retention) and *Mutravikara* (disorders of urine).^{38, 39, 40} 'Ama' (incompletely digested element/free radicals) may be considered as the biochemical manifestations in CKD. Accumulation of *Ama* leads to *Chaya avastha* of the disease. Hence in this early stage of the disease generally symptoms are not produced. When these free radicals/*Ama* freely circulate and attain *Prasara avastha*, they produce all

the symptoms. A fundamental principle in *Āyurveda* is that by tackling *Āma* at an early stage, disease progression can be curbed.⁴² *Srotas* (The circulatory channels) are carrying unrestricted flow of the materials such as food, *Dosha*, *Dhatu*s, and *Malas* and are site of metabolic exchanges. Mostly involvement of *Mutravaha* & *Medovaha Srotas* are seen in CKD pathology. *Srotas* favor the *Dosha*–*Dushya* conglomeration. Therefore, any defect in the *Srotas* must be corrected quickly for the restoration of normal health.^{40, 41}

Probable *Nidanas* (etiological factors) of CKD can be postulated as, The Metabolic factors including intake of excessive food or *Viruddha ahara-viharas*(incompatible food intake), excessive and continuous intake of the *Kaphkarak ahara-viharas*(diet and lifestyle increasing *Kapha* body humour) such as ingestion of sweet, oily cold food substances etc. and lifestyle such as *Divasvapna*(daysleeping), *Ratrijagarana*(awekaning in night), *Vega dharana*(suppression of natural urges), *Avyayama*(lack of exercise), lazy & sedentary habits etc. ,which vitiate *Vata* and *Kapha dosha*. All these metabolic factors create *Mandagni* and then produce *Ama*. Psychological factors such as *Chinta*(worry), *Bhaya*(fright), *Krodha*(anger), *Shoka*(grief), etc. act as contributory factor towards disease progression. Stress has been shown to be associated with CKD risk factors such as hypertension, diabetes, or obesity.⁴³ Genetic factors mainly include the *Beejadush-ti*(genetic) produced due to abnormal *Shukra*(sperm) and *Shonita*(ovum) & is transmitted over generations. Both genomic and environmental factors contribute to this complex heterogeneous disease. CKD heritability is estimated to be high (30–75%).⁴⁴ In today’s modern era, the Environmental factors play a crucial role in the disease manifestation and progression. Particulate matter, an air pollutant that is a complex mixture of small particles and liquid droplets arising from the combustion of fossil fuels and biomass, has come into focus for its adverse effects⁴⁵ $PM_{2.5}$ can be filtered by the glomerulus and may thus lead to indirect and direct kidney tissue injury.⁴⁶

Thus, depending on the various involved *Hetus* (etiological factors), *Doshas* get vitiated which further leads to vitiation of *Dhatu* resulting in *Srotodushti*. Hence the process of course of disease from *Nidana sevana* to clinical presentation of various symptoms compiles its ‘*Samprapti*’. In CKD, impairment of renal function is brought about by the derangement of *Tridoshas* (three humours; *Vata*, *Pitta*, and *Kapha*), with predominance of *Vata kapha dosha*, *Agnimandya* (weak digestive fire), *Srotosanga* (obstruction in microchannels of *Mutravaha srotas*), and *Vimarga gamana*. It is essential to break the pathogenesis to get the desired results. Thus, the treatment of CKD aims at the enhancement of digestive fire, balancing vitiated *Doshas*, diuresis and control of excessive salt and water retention, *Sroto shuddhi* and *Rasayana chikitsa*; which may create an improved nutritional status by acting on levels of *Rasa*, *Agni*, and *Srotas*^{47, 48}

CONCLUSION

There exists no direct reference of the disease in *Ayurveda classics*, nevertheless a detailed analysis of the *Lakshanas*, the state of *Doshas*, *Dhatu*s, *Agni*, *Srotas* etc. depicted CKD as very complex disorder with multiple etiopathology and mixed symptoms. Hence critiquing basic concepts is capable of yielding an enlightened understanding of the disease framing the disease pathogenesis thereby mapping a route for effective disease management.

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