IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Ayurvedic Pathogenesis Of Chronic Kidney Disease: A Critical Review

Dr. Sneha Bhagwan Chate [1], Assi .Prof. Dr. Aishwarya Ranade [2]

1. PG Scholar, Rognidan Evum Vikriti Vigyan, Tilak Ayurved Mahavidyalaya, Pune

2.Assistant Professor , Rognidan Evum Vikriti Vigyan, Tilak Ayurved Mahavidyalaya, Pune

ABSTRACT

Chronic Kidney Disease (CKD) is a progressive condition that poses significant public health challenges, affecting over 10% of the adult population worldwide. This study explores examining etiopathogenesis of CKD through the lens of Ayurveda, to facilatate a appropraite treatment regimen in an efficient patient care. CKD is characterized by a gradual decline in kidney function, typically marked by a decrease in glomerular filtration rate (GFR) and proteinuria. The absence of direct references to CKD in classical Ayurvedic texts necessitates an understanding of the disease through its related concepts—*Nidan* (aetiology), *Lakshan* (signs), and *Samprapti* (pathogenesis).

CKD symptoms develop insidiously, with advanced stages presenting as dyspnoea, peripheral oedema, and fatigue. The study identifies prodromal symptoms and establishes clinical correlations with *Ayurvedic* concepts, enabling a comprehensive understanding of CKD's progression.

Our analysis reveals that CKD corresponds to the vitiation of *Meda* (fat) and *Rakta* (blood) *dhatus*, influenced by unhealthy dietary habits and lifestyle choices, leading to the dysfunction of *Mutravaha srotas* (urinary channels). The pathogenesis involves imbalances in the three *doshas (Vata, Pitta, and Kapha),* with a notable predominance of *Vata*, causing *srotorodha* (obstruction of channels) and consequent renal impairment.

This research emphasizes the importance of addressing dietary and lifestyle factors in managing CKD. Proposed Ayurvedic treatments focus on enhancing digestive fire, balancing doshas, promoting diuresis, and ensuring *srotosodhana* (cleansing of channels). By integrating *Ayurvedic* principles into contemporary medical frameworks, we aim to provide a holistic approach to CKD management, ultimately improving patient outcomes and quality of life.

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

INTRODUCTION

Chronic Kidney Disease (CKD) is a progressive condition affecting millions worldwide. It has a high rate of morbidity and mortality. Over 10% of adult population suffers from CKD, which has become a significant public health concern[1]. 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.[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 preventive 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 *Vrikka* (kidney), *Mutra Nirman Pravartan* (urine formation & excretion), involved *Doshas* (biological humour), *Dhatu* (tissues), *Mahabhoota* (five outstanding elements), *Srotas* (circulatory channels), *Srotodushti*(vitiated channels) *Hetu sevana* (aetiological factors) & *Lakshana* (signs & symptoms)so as to understand the etiopathogenesis involved in CKD, Kidney may be correlated with *vrikka*. The embryological origin of *Vrikka* is from *Medas* and *Rakta*. *Meda* and *Rakta dhatu* vitiating *ahara viharas* are contributing for the pathogenesis of CKD. Considering the factors involved in pathogenesis, a management plan might also be suggested. 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. The review drawn from *Ayurvedic* texts,including the *Charak Samhitas* and *Sushruta samhita*, commentaries and Databases.

Results & Observations CKD - *Ayurvedic* view

There has been no reference to *Vrikkaroga* in *Brihatrayees*. Thus, it might be understood in terms of *Anuktavyadhi*. In light of the CKD disease syndrome, which affects multiple systems and has a broad variety of clinical symptoms, the disease should be assessed based on three aspects in order to improve comprehension. 1.Nature of the disease (*Vikaaraprakrithi*)

2. Site of its manifestation (*Adhishtananthara*)

3. Etiological factors (*Hethuvisesha*)[6]

Five fold clinical assessment criteria for disorders (*Nidanapanchaka*) are another way to look at it. These criteria which include causative factor (*Nidana*), prodromal symptoms (*Poorvarupa*), symptoms (*Rupa*), relieving factors (*Upasaya*), and pathogenesis (*Samprapthi*).
It facilitates the understanding of illness development and diagnostics.

Etiology:

CKD can be considered a disease affecting *madhyam roga marga*. *Vrikka* becomes the *adhishtana* of CKD. *Vrikka* is one of the *moolasthanas* of *medovahasrotas* [7] and originated from *Rakta* along with *Medas* [8]. The factors that vitiate the *Medas* and *Rakta* may act as nephrotoxic later. Excessive consumption of *guru, snigdha, sheeta ahara*, and food and drinks with an *abhisyandi* nature will cause *Kapha, Meda* vitiation and

excess use of *lavana-amlakshara-teekshn-ushna aharas* and *vidahi aharas* may result in *Rakta* vitiation Unhealthy eating habits may be a major contributing factor to the development of chronic kidney disease (CKD) in our modern lifestyle. Compared to the older generation, the younger generation likes new trends and a variety of food items such as fast food, Chinese food, grilled meat, red meat, spicy food, junk food, canned food with preservatives, chocolates, ice creams, pudding, fried items etc as well as sedentary lifestyle. The frequency of intake of these kinds of food items is also higher in the current era. These *ahara* and *vihara* are *Rakta* and *Meda* vitiating and contribute to CKD. CKD is also influenced by hereditary disorders (3.1%), including polycystic renal disease. *Charakacharya* explains that anomalies in the *beeja* (germ cell), *beejabhaga* (chromosome), and *beejabhagaavayava* (gene) [9] respectively, lead to anomalies in the structures generated from them.

Prodromal symptoms

During the *sthanasamsraya* stage of *shatkriyakala*, *poorvarupas* become visible [10]. According to *Ayurveda*, not all diseases must be linked to *poorvarupa*; for example, V*atavyadhi* has *avyaktapoorvarupa* [11], like this CKD is having an indistinct prodromal symptom because no evident prodromal features are seen in first stage of CKD. In contrary to this, *Bhaishajyaratnavali* mentioned *poorvarupa* to the *vrikkaroga* like *nidranasa* (Insomnia), *agnimandhya* (Loss of appetite), *shopha* in *netra*, *asya* and *pada* (Generalized edema), *ushna sparshanadi*, *stabdha gatrata*, *twaka rookshata* (Dryness on skin)[12] .

Symptomatology

Symptoms of CKD develop very slowly and are not specific to the disease. CKD is generally discovered accidentally or through routine testing using urine and serum chemical profiles. Patients with advanced chronic kidney disease (CKD) may have dyspnoea, peripheral oedema, pruritis, fatigue, decreased appetite, nausea, vomiting, metallic taste in their mouths, unexpected weight loss, and mental disturbances.

Clinical features of various stages of CKD have similarities with symptoms seen in the *vrikkaroga* mentioned in *Bhaishajyaratnavali* [13] .

Loss of appetite: Stage 4 CKD - *Agnimandya*

Vomiting: Stage 4 CKD - *Chardi*

Skeletal abnormality due to hypocalcemia& secondary hyperparathyroidism - *Sarvanga Vedana*

Generalized edema - *Shopha*

Dry scaly skin- *Twaka rukshata*

Anemia due to erythropoietin deficiency- *Pandu*

Oliguria/bladder dysfunction- *Mootravaha srotas* dysfunction

Cardiovascular manifestations - *Hrudroga*

Upashaya

In the early stages of CKD, treatments that helps in *aama pachana*, *srotosodhana*, *rakta prasadana*, and *kleda medososhana* can be considered *upashaya*. *Medo vriddi kara nidanas* such as a sedentary way of living, an overindulgence in *guru*, and *snigdha seeta abhisyandi aharas* and further more, high *lavana amla teekshna kshara* and *vidahi ahara*, *raktadushtikara nidanas* accelerate the progression of the condition.

Pathogenesis

Pathogenesis 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 microchannels of Mutravaha srotas) and *Vimarga gaman* (following altered routes).

Adhishthan: *Basti* (urinary bladder)

Vyadhi swabhava: *Chirkari*(chronic)

In CKD primary pathology involved is glomerulonephritis, which reduces the ability of renal tissue to filter blood and prevents the removal of toxic substances from the blood. At the end stage of CKD, the toxic metabolites retained inside the body slowly and affecting other organs. CKD is the outcome of a decline in GFR and an increase in *kleda* throughout the body (uremic syndrome). Diabetes mellitus is the most common cause of chronic kidney disease (CKD).

According to *Ayurveda*, diabetes may be correlated with *prameha*. In *prameharoga samprapti*, the *stanasamsraya* occurs at *vastipradesha* [14]. In diabetes mellitus, the function of *basti* is impaired, which can lead to excess fluid accumulation in the body. As a result of the disease's chronicity, *vata dosha* becomes predominant, increasing *ruksha*, *khara guna*, and *soshana* of *kleda*. This can result in glomerulosclerosis in CKD. In non-diabetic instances foods and activities that vitiate *rakta* and *meda*, particularly in relation to *medo dhatu*, cause *aama* development. It leads to *medodhatvagni* impairment, which further accumulates *malasanchaya* in *medovahasrotas*. Since *vrikka* becomes the *moolasthana* of *medovaha srotas* and whose embryological genesis is from *rakta* and *meda* it becomes the asrayasthana and functional impairment of *basti* which further leads to chronic kidney disease (CKD).

Based on *shatkriyakala*

Depending on GFR, CKD has five stages. wherein the initial three stages are mainly asymptomatic. Only the *sthanasamsraya* stage of *shatkriyakala* takes place here. *Srotorodha* to *raktavahasrotas* can happen in this stage. The primary urinary abnormality in these stages is therefore albuminuria. After the *sthanasamsraya* stage, specific disease-related symptoms start to show. Here, there were some structural and functional abnormalities. *Aruchi*, *chardi*, *malabandha*, *agnimandhya*, and *pandu* symptoms are present at the stage 4 CKD. *Bhedavasta* can be used to describe stage 5 CKD. This *vatapradhana tridoshakopa* may have caused the *dhatukshaya* and *ojakshaya*, which ultimately caused other systemic manifestations found in full blown CKD.

DISCUSSION

Acharya *Charaka* has established that diseases are innumerable, 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 *DoshaVaishamyata* (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.[15].

In *Ayurveda*, Chronic Kidney disease bears 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 *Matruja* (maternal origin) organs.[16,17] Kidneys are constituted from the essence of *Rakta* and *Meda dhatu* (blood & fat tissue)[18] &

facilitates removal of waste in the form of urine formation & excretion.[19,20] *Hetu sevan* (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 Strotas originating from *Vrikka* [21], 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.[22] 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.[23] Therefore Diabetes is seen as a widespread CKD manifestation whereas *Ayurveda* principles recognise *Medovahasrotas* involvement for manifestation of *Prameha* in CKD.

Mutravaha Strotas originating from *Mutrashaya* and *Vankashana*. [24] get aggravated by intake of food or drinks & having sexual intercourse while having the urge for micturition, suppressing natural urges of micturition.[25] 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.[26] Altered urine frequency composition, dysuria etc. are characteristic of CKD depicting *Mutravaha Srotas* involvement.

Swedavaha Strotas originating from *meda* and *lomakupa*.[27] 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).

The *Dushit Kleda* and *Vata* results in *Vata rakta* (gout) further depicting signs and symptoms of oedema, coppery skin discolouration, tingling sensation, itching & sloughing. [29] 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*, *Mutrasada* (a type of urinary disorder), *Mutrakshaya* (a type of urinary disorder), *Pandu*(anaemia) *Shotha*(odema), *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.

Medadhatu (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*.

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.[30] 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 *Laghuahara* (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). [31,32,33]

'*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. [34]

Srotas (The circulatory channels) are carrying unrestricted flow of the materials such as food, *Dosha*, *Dhatus*, 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. . [35, 36]

Probable *Nidanas* (etiological factors)of CKD can be postulated as, The Metabolic factors including intake of excessive food or *Viruddha aharaviharas*(incompatible food intake), excessive and continuous intake of the *Kaphkarak aharaviharas*(diet and lifestyle increasing Kapha body humour) such as ingestion of sweet, oily cold food substances etc. and lifestyle suchas*Divasvapna*(daysleeping),*Ratrijagarana*(awekaninginnight),*Vegadharana*(suppression of natural urges), *Avyayama*(lack of exercise), lazy & sedentary habits etc. ,which vitiate *Vata* and *Kapha dosha*. [37]

All these metabolic factors create *Mandagni* and then produce *Ama*.[38] 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.[39,40] Genetic factors mainly include the *Beejadushti*(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.[41] CKD heritability is estimated to be high (30–75%).[42 ,43] 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* [44,45]

CONCLUSION

The early stages of CKD are typically asymptomatic and are detected only on investigations. *Vrikka* originated from Rakta and Meda. Therefore, nephrotoxic agents are involved in *rakta* and *meda* vitiation. *Kledavahana* serves as the purpose of *mootra*. If urine fails to carries *kleda*, it will accumulate in the body and results in many diseases. In accordance with Ayurveda, CKD is an example of an anuktavyadhi. *Dhatwagni mandya kara*, *dhatu mala sanchayakara*, and *srotorodha kara* are all involved in the primary pathophysiology of chronic kidney disease (CKD). The pathogenesis of chronic kidney disease is

multifaceted and progressive in nature. Hence, the management approach also varies according to the stage of the disease and the status of involved doshas and dooshyas.

REFERENCES

1. Eknoyan G, Lameire N, Eckardt K, Kasiske B, Wheeler D, Levin A, et al. KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney International Supplements. 2013;3(1):5–14

2. Levin A, Rocco M. KDOQI clinical practice guidelines and clinical practice recommendations for diabetes and chronic kidney disease. American Journal of Kidney Diseases. 2007;49(2): S10–S179.

3. Elendu C, Elendu RC, Enyong JM, Ibhiedu JO, Ishola IV, Egbunu EO, Meribole ES, Lawal SO, Okenwa CJ, Okafor GC, Umeh ED, Mutalib OO, Opashola KA, Fatoye JO, Awotoye TI, Tobih-Ojeanelo JI, RamonYusuf HI, Olanrewaju A, Afuh RN, Adenikinju J, Amosu O, Yusuf A. Comprehensive review of current management guidelines of chronic kidney disease. Medicine (Baltimore). 2023 Jun 9;102(23): e33984.

4. Kovesdy CP. Epidemiology of chronic kidney disease: an update 2022. Kidney Int Suppl (2011). 2022 Apr;12(1):7-11.

5. Parveen R., Khan N., Zahiruddin S., Ibrahim M., Anjum V., Parveen B., Khan M.A. TLCBioautographic Evaluation for High-Throughput Screening and Identification of Free Radical Scavenging and Antidiabetic Compounds from Traditional Unani Medicinal Plant: Citrullus colocynthis Schrad. J. AOAC Int. 2020 doi: 10.5740/jaoacint.19- 0287. 6. Kazancioğlu R. Risk factors for chronic kidney disease: an update. Kidney Int Suppl (2011). 2013 Dec;3(4):368-371.

7. Kakitapalli Y, Ampolu J, Madasu SD, Sai Kumar MLS. Detailed Review of Chronic Kidney Disease. Kidney Dis (Basel). 2020 Mar;6(2):85-91.

8. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Ch.Su. -18, Slok-44, Page-346

9. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Viman sthana, Chapter 5 verses 8, Pg. 174.

10. Agnivesa's, Charaka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Sutra Sthana, Vol-II, Chapter 28 verses 15, Pg.577

11. Agnivesa's, Charaka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Viman sthana, Chapter 5 verses 20, Pg. 178.

12. 2. Kaviraj Sri Ambhikadatta Sastri Ayurvedacharya, Bhaishajyaratnavali ,Choukambhaprakashan ,Varanasi 2021 chapter 93,verse 6-10, pg:1193

13. Acharya Sushruta, Sushrut Samhita, Translation by Bhisagratna Kunjilal B, varanasi 1st edition,1998, Uttar tantra, Vol-III, 58/2-3, P.-569.

14. Acharya Sushruta, Sushrut Samhita, Translation by Bhisagratna Kunjilal B, varanasi 1st edition,1998, Uttar tantra, Vol-III,58/16, P.-571.

15. Acharya Sushruta, Sushrut Samhita, Translation by Bhisagratna Kunjilal B, varanasi 1st edition,1998, Uttar tantra Vol-III, 58/23-25, P.-572-573

16. Agnivesa's, Charak Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Vol. I, Ch. Sutra 20/3, Pg 360.

17. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Ch. Su., Vol-I, Chapter12, Slok-3, P.-234.

18. Acharya Sushruta, Sushrut Samhita, Translation by Bhisagratna Kunjilal B, varanasi 1st edition,1998, Susruta Samhita Sarira-Sthana, Vol-II, Chapter-3 verses 32, P.-164 19. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Charak Shareer Sthana, Vol-II Chapter 3 verses 6, Pg.370

20. Acharya Sushruta, Sushrut Samhita, Translation by Bhisagratna Kunjilal B, varanasi 1st edition,1998, Shareer sthan. Vol-II, Chapter 4 verses 31, Pg.172

21. Vagbhata's Asthanga Hrdayam, English translation by, Prof, K.R. Srikantha Murthy, Chowkhamba Krishnadas Academy, Varanasi, Reprint 2022, Vol-1, Sutra sthana, Chapter 12 verses 8, Pg. 167.

22. Vagbhata's Asthanga Hrdayam, English translation by, Prof, K.R. Srikantha Murthy, Chowkhamba Krishnadas Academy, Varanasi, Reprint 2022, Vol-1, Sutra Sthana, Chapter 12 verses 9, Pg. 167.

23. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Viman sthana, Chapter 5 verses 7-8, Pg.174)

24. Kindermann W. Creatine Kinase Levels After Exercise. Dtsch Arztebl Int. 2016 May 13;113(19):344.

25. Gerich JE. Role of the kidney in normal glucose homeostasis and in the hyperglycaemia of diabetes mellitus: therapeutic implications. Diabet Med. 2010 Feb;27(2):136-42. 26. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Sutra Sthana, Vol-II, Chapter 28 verses 15, Pg.577

27. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Viman sthana, Chapter 5 verses 8, Pg. 174.

28. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Viman sthana, Chapter 5 verses 20, Pg. 178.

29. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Viman sthana, Chapter 5 verses 7-8, Pg. 174.

30. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Viman sthana, Chapter 5 verses 8 Pg. 174.

31. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Viman sthana, Chapter 5 verses 21 Pg. 178 32.

32Susie Q. Lew, Jai Radhakrishnan, Chapter 33 - chronic kidney disease and Gastrointestinal Disorders, Editor(s): Paul L. Kimmel, Mark E. Rosenberg, Chronic Renal Disease (Second Edition), Academic Press, 2020, Pages 521-539, ISBN 9780128158760, https://doi.org/10.1016/B978-0-12-815876-0.00033-4.

33. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Viman sthana, Chapter 5 verses 22 Pg. 178

34. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Viman sthana, Chapter 5 verses 8 Pg. 174

35. Goel V, Sil A, Das A. Cutaneous Manifestations of Chronic Kidney Disease, Dialysis and Post-Renal Transplant: A Review. Indian J Dermatol. 2021 JanFeb;66(1):3-11. 36. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019 Chikitsa sthana., Vol - V, Chapter 29 verses 27 Pg. 95

37. Acharya Sushruta, Sushrut Samhita, English translation by Kaviraj Kunjilal Bhisagratna, Chowkhanba Sanskrit Series Office varanasi 1st edition,1998, Su. Sutra 21/4, Pg 185

38. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Vol. IV, Chikitsa sthana Chap. XV-XXVI, Slok 15/49 pg no 26.

39. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Vol. II, Vimana sthana Chap. I-IX, Slok 5/8, pg no 174.

40. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhanba Sanskrit Series Office, Varansi, reprint 2019, Vol. II, Vimana sthana Chap. I-IX, 5/8, pg no 174

41. Byadgi PS. Critical appraisal of Doshavaha Srotas. Ayu. 2012 Jul;33(3):337-42.

42. Di Q, Dai L, Wang Y, Zanobetti A, Choirat C, Schwartz JD, Dominici F: Association of short-term exposure to air pollution with mortality in older adults. JAMA 318: 2446–2456, 2017. 10.1001/jama.2017.17923

43. Kshirsagar AV, Zeitler EM, Weaver A, Franceschini N, Engel LS. Environmental Exposures and Kidney Disease. Kidney360. 2022 Oct 17;3(12):2174-2182

44. Agnivesa's, Caraka Samhita, English translation & Critical Exposition by Dr. Ram Karan Sharma & Vaidya Bhagwan Dash, Chowkhamba Sanskrit Series Office, Varanasi, reprint 2019, Vol. V, Chikitsa sthana Chap-28/10, pg-21.

45. Kapoor, Alka (Babbar); Dang, Poonam Gulati1 . Role of Ayurveda in the management of chronic kidney disease: A case study. Journal of Ayurveda Case Reports 3(1): p 14-19, Jan– Mar 2020