

An Ayurvedic Approach to Treatment of Chronic Kidney Disease in Fluoride Water Affected Areas

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ABSTRACT

Kidneys are the organs that have numerous biological roles like filter waste products and extra fluid from the blood, balancing electrolyte, regulating blood pressure and initiating the production of red blood cells. In dysfunction condition, the major amount of toxic waste starts accumulating in the body damaging the kidneys eventually leading to kidney failure. Chronic Kidney Disease (CKD) occurs when one suffers from gradual and usually permanent loss of kidney function over time. Based on the clinical features of CKD and as per the fundamentals of *Ayurveda*, it can be considered as the disease of *Mutravaha Srotasa*, specifically the *Mutraghata*. As the kidneys are principally made up of the “*Rakta*” (blood) and “*Meda*” (fatty tissue), *Dhatu*s (tissues). Treating the imbalances of these two *Dhatu*s can be an effective way to treat the renal ailments. So the *Ayurvedic* drugs that can modulate these *Dhatu*s can be effective in renal diseases. During an AYUSH health camp in fluoride water affected areas of district Gariyaband, Chhattisgarh, we felt that we should have an Ayurvedic treatment plan for fluoride induced CKD, so that every patient could be benefited from the kidney disease prevalent in this area. It also being a CKD, can be managed on the principles of the *Ayurvedic* management of *Mutraghata*. The management can thus include various single and compound plant based formulations, herbo-mineral formulations, *Panchakarma*, *Rasayana*, *Pathya-Apathya* (congenials), along with lifestyle modification. This paper reviews the concept of *Ayurveda* in the management of Chronic Kidney Disease (*Vrikka-Vikara*).

Key words: *Ayurveda*, Chronic Kidney Disease, Fluoride, Treatment

INTRODUCTION

Chronic kidney disease (CKD) is becoming increasingly common worldwide. CKD is characterized by a permanent loss of nephrons and an eventual decline in Glomerular Filtration Rate (GFR).^[1] Risk factors for developing CKD differ between races and countries. It would be interesting to know the incidence of CKD and its causes in India, which is a densely populated country with low income, different food, cultural traditions and lifestyle habits. CKD is one of the major problems and among the top eight cause of death in India.^[2] Fluorosis is an important cause of CKD. Fluorosis is a major public health problem in endemic areas as Jordan, Turkey, Chile, India, Bangladesh, China and Tibet. Many studies have reported the endemicity of Fluorosis in these geographical areas where the fluoride content in drinking water is high.^[3] In India, various states have been reported of being endemic of fluorosis.^[4]

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During an AYUSH health camp in fluoride water affected areas of district Gariyaband, Chhattisgarh, we felt the need for devising an *Ayurvedic* treatment plan for fluoride induced CKD, in the benefit of the patients suffering from this kidney disease prevalent in this area.

Modern therapeutics is still deficient in significant and safe management of CKD. *Ayurvedic* system of medicine is holistic and free from side effects. In *Ayurvedic* texts, kidney (*Vrikka*) has been given more importance in connection with filtration, regulation of water and electrolyte balance and other metabolic functions and has been considered as the root of *Mutravaha srotas*. So kidney is very much important in all those diseases which are concerned with *Mutravaha Srotas*. CKD is the disease of *Mutravaha Srotasa*, as per the fundamentals of *Ayurveda*; and based on the clinical features of this disease, it can be well correlated with *Mutraghata*. Though all the three *Doshas* (humours) as well as all the *Dushyas* (tissues, etc.) are involved in the disease, *Kapha* is responsible in blocking microvessels and developing microangiopathy. *Vata* is responsible for degeneration of the structure of the kidney. The kidneys are made up of principally the *Rakta* and *Meda Dhatu*s. Treating the imbalance of these two *Dhatu*s can thus also be an effective way to

treat the kidney diseases. The *Ayurvedic* treatment of CKD is based on three principles; treating the damaged kidneys, treating the body tissues (*Dhatus*) which make up the kidneys and treating the known cause. As mentioned earlier, CKD is a specific form of renal disease,^[5] and Fluorosis induced renal damage is also a type of CKD. Hence it can also be managed on the aforesaid *Ayurvedic* principles of management of *Mutraghata*. Also, the tissue damage can be prevented and repaired by *Rasayana* (rejuvenating) drugs because they have the capability to improve qualities of tissues and hence increase resistance of the tissues with regeneration. On the other hand, blockage can be removed by *Lekhana* drugs.

Aims and objectives of this study

1. To study the importance of *Ayurvedic* medicine in prevention and management of CKD.
2. To propose a standard treatment plan in *Ayurveda* medicine for management of CKD in fluoride water affected areas.

MATERIALS AND METHODS

Various *Ayurvedic* and modern text books, journals and research papers were referred to. It focussed on subsections dealing with prevention and management of CKD in *Ayurveda* for fluoride water affected areas.

DISCUSSION

Modern perspectives of fluorosis induced Chronic Kidney Disease

Chronic Kidney Disease (CKD)

CKD is a syndrome that results from progressive and irreversible destruction of nephrons resulting from a number of causes. It is defined as kidney damage for >3 months, as defined by structural or functional abnormalities of the kidney, with or without decreased GFR, manifest by either: (i) Pathological abnormalities or the presence of markers of kidney damage, including abnormalities in the composition of the blood or urine, or abnormalities in imaging studies or (ii) GFR <60 ml/min/1.73m² for 3 months, with or without kidney damage. This is usually progressive in nature. In most of the cases, demonstration of bilateral contracted kidneys, along with the clinical features of uremia serve as the distinguishing features of chronicity. However, in CKD due to diabetes, amyloidosis and polycystic kidney disease, the kidney size may be normal or even bigger. Recently, a classification system which utilizes GFR rather than serum creatinine for staging of CKD has been proposed by the National Kidney Foundation.^[6]

Fluorosis

Fluorosis is a disease caused by deposition of fluorides in the hard and soft tissues of the body. Fluoride poisoning can result either from exposure to excessive quantities of fluoride (> 10 ppm) in drinking water or from industrial exposure to fluoride dust and consumption of brick teas. Clinical features include yellow staining

and pitting of permanent teeth, osteo-sclerosis, soft tissue calcification, increased risk of kidney stone formation, deformities (e.g. kyphosis) and joint ankylosis. Changes in the bones of the thoracic cage may lead to rigidity that causes dyspnoea on exertion. Very high doses of fluoride may cause abdominal pain, nausea, vomiting, seizures and muscle spasm. In calcium-deficient children, toxic effects of fluoride manifest even at marginally high exposures to fluoride. The maximum impact is seen in communities engaged in physically strenuous agricultural or industrial activities.^[7]

Other Forms of Fluorosis induced Diseases: In endemic areas, the diagnosis of dental and skeletal fluorosis does not present much of a problem. In industries, where fluoride toxicity is a known hazard, skeletal fluorosis marked by restriction of spine movements can easily be diagnosed. In early stages of skeletal fluorosis patients complain of arthritic symptoms, which have to be differentiated from other types of arthritis. Diseases that are associated with osteo-sclerosis also need to be considered in the differential diagnosis. In children and young adults, genu valgum and other deformities have to be distinguished from those associated with rickets and sometimes with osteo-dystrophies. When sclerosis of the vertebral column is not marked, calcification of the interosseous membrane of forearm, a radiographic sign of fluorosis, should suggest the diagnosis of fluorosis.^[12]

Endemic Fluorosis: In India over 50% of ground water sources have excess of fluoride and affect more than 150,000 villages. Potable water supply with permissible levels of fluoride though desirable cannot obviously be made available to the vast number of people neither can they be shifted from their area of domicile. Thus, there is a rationale to press into service water-purifying or defluoridation plants in those areas. Defluoridation plants are based on *Nalgonda* method of lime and alum and domestic units were based on filtration of fluoride-rich water with PAC granules, which are activated alumina. Aluminum has been incriminated in the causation of two neuro-degenerative diseases, namely Parkinsonism and myotrophic lateral sclerosis. Defluoridation methods are expensive and difficult to maintain and they also increase aluminum levels of filtered water. Hence, these methods are not preferred. Nutrition appears to play a crucial role in the incidence and severity of fluorosis and hence a balanced diet having adequate calcium, magnesium and vitamin C should be promoted to reduce the toxicity of fluoride.^[8] A more recent examination of over 18,000 people living in India, exposed to water with fluoride concentrations between 3.5 ppm and 4.9 ppm, reported an increased risk of kidney stone formation in this population.^[9]

Mutraghata^[10] the closest Ayurvedic correlate of Fluorosis induced Chronic Kidney Disease

Fluorosis induced CKD, which is characterized by low urinary output occurs due to obstruction in the passage of urine, can be viewed as a type of *Mutraghata*.^[9] The disorders of *Mutravaha*

Srotasa, which have resemblance with the description of urological disorders on modern parlance, are well described in *Ayurvedic* literature. For a proper understanding of fluorosis induced CKD, the following classification of *Mutraghata* should be critically analyzed-

- *Vatakundalika*, *Vatabasti* and *Mutrajathara* can be grouped under Neurogenic disturbances in the bladder functioning.
- *Vatastheela*, *Mutragranthi*, *Mutrotsanga* and *Bastikundalika* can be grouped under organic disturbances, where the symptoms of retention of urine, increased frequency of micturition, distension of abdomen and mass felt per rectum etc. may be present due to a growth either in the bladder, urethra, prostate or other related structures.
- *Mutatrita*, *Mutrakshaya*, *Ushnavata*, *Mutraukasada*, *Vidavighata* and *Mutrashukra* can be grouped under category others, where the disturbance in urinary function is either due to physiologic reasons or injury etc., but not due to obstruction.

Diagnosis

Clinical diagnosis of Fluorosis induced CKD

On the basis of history and clinical presentations as described previously, a patient can be diagnosed provisionally as case of CKD. The main characteristic symptoms of fluorosis induced CKD are oliguria-anuria with edema (facial/generalized) in an individual residing in fluorosis endemic area. The condition may be associated with nausea and/or vomiting, loss of appetite, muscle cramps vertigo/dizziness with or without headache, hiccough, breathlessness, weakness/malaise and anaemia.^[12]

Laboratory diagnosis

1. **Urinary, Serum and Bone Fluoride Estimations-**^[11] Urinary fluoride levels are the best indicators of fluoride intake. Since fluoride excretion is not constant throughout the day, 24-hour samples of urine are more reliable than random or morning samples. There is a linear relationship between urinary fluoride levels and fluoride intake. The urinary and serum levels of fluoride in normal and fluorotic cases are listed in [Table 1].

Table 1: Serum and Urine Fluoride Levels in Healthy Adults and Patients of Fluorosis

Group	Number	Serum fluoride levels	
		Range mg/L/ppm	Mean mg/L/ppm
Healthy adults	500	0.03 to 0.13	0.08
Patients of fluorosis	17	0.04 to 0.28	0.16
		Urine fluoride levels	
		24-hr/mg/ppm	mg/L/ppm
Healthy adults	60	0.38 to 1.82	0.88
Patients of fluorosis	17	0.68 to 7.80	3.28

Bone fluoride content measures the extent of bone fluoride retention and is a useful complement of bone histological studies for

the diagnosis of skeletal fluorosis. In skeletal fluorosis, fluoride content varies between 6000 and 8400 ppm in bone ash, normal fluoride content ranges between 500 and 1000 ppm or mg/kg.^[11]

2. **Urine-** Mean 24 hour urinary excretion of fluoride increased (> 1.5ppm). Albuminuria is commonly seen in all cases. Urine is large in volume. It may be 3 liters or more in 24 hours. Colour: clear and Sp. Gr. is low and fixed at 1010.^[14]
3. **Blood Biochemistry-** Blood Urea, Creatinine, NPN and BUN level may be high. Anaemia is present.^[14]
 - A. Fluoride level in blood >0.27 ppm.
 - B. Plasma alkaline phosphatase may be elevated.^[15]

Blood Sugar: Blood sugar level should be checked for the patients of diabetic nephropathy, often there is reduction in blood sugar levels in diabetics as they develop renal insufficiency.^[16] S. Uric Acid: Serum uric acid may rise as a secondary hyperuricemia. Glomerular Filtration Rate (GFR): less than 60 ml/min/1.73 m² and persistent (present for > 3 months) with or without any symptoms and signs.^[17]
4. **Radiological:** Osteosclerosis in spine and pelvis, breaking and chalky white ground glass appearance, Calcification of intervertebral ligament, sacrospinous and sacrotuberous ligament of interosseous membrane of forearm.^[15] USG of kidney, ureter and bladder with signs of altered or loss of corticomedullary differentiation with raised cortical echotexture of the kidney. The size of the kidneys mostly becomes smaller.^[16]

General management

1) General preventive strategies

- (a) Drinking water should contain 0.5 - 0.8 ppm of fluoride. Defluoridation of water if high content or deep bore drinking water.
- (b) Vitamin C and Calcium give protection against toxic effect of fluorides.
- (c) Of the disease- Avoid sea fish, cheese and tea. Don't use toothpastes and other production supplements with fluoride.^[17]

Preventive strategies as per *Ayurveda* are- 1. *Pathya-Ahara/Vihara* (healthy diet/routine) 2. *Rasayana* (rejuvenation) 3. *Panchakarma* (the five step *Ayurvedic* biopurification therapy).

2) Ayurvedic management

It can broadly be divided into *Shodhana* (biopurification) and *Shamana* (palliative treatment).

A. Shodhana: *Panchakarma*, specially *Basti* therapy, *Sanshamana* drugs like preparations of *Varuna*, *Shigru*, *Punarnava*, *Trinapanchamula*, herbo-mineral drugs like preparations of *Shilajatu*.^[18] The therapy includes-

1. *Nadi-Svedana* in both the loin region once in the morning.
2. *Niruha Basti* (procto-colonic administration of *Ayurvedic* medicine) every day before lunch time.

Preparations- *Madhu* 30 ml + *Saindhava Lavana* 5 gm + *Tila Taila* 30 ml + *Kalka Dravya* 15 gm [*Shatapushpa*

(*Pimpinella anisum*), *Madanaphala-Pippali* (*Randia spinosa*), *Vacha* (*Acorus calamus*) in equal quantity] + *Punarnavadi Kwatha* – 240 ml according to classical method. *Basti* must be retained not less than 20 minutes.

3. *Uttarabasti: Dashamoola Taila*, particularly in cases of obstructive uropathy.^[18] *Panchakarma*- Specially *Basti* therapy, *Sanshamana* drugs like preparations of *Varuna* (*Crateva religiosa*), *Shigru* (*Moringa oleifera*), *Punarnava* (*Boerhavia diffusa*), *Trinapanchamula*, herbomineral drugs like preparations of *Shilajatu*.^[19]

B. Shamana Chikitsa: In the initial stage when the patient is having mild features of chronic renal failure, then along with dietary corrections two or more of the following drugs may be given-^[18]

Drugs	Dose	Time	Duration	Anupana (given with)
<i>Gokshura Churna</i>	3-6 gm	After meal/ thrice daily	2-3 weeks	water
<i>Punarnava Churna</i>	2-3 gm	After meal/ thrice daily	2-3 weeks	water
<i>Guduchi Churna</i>	3-6 gm	After meal/ thrice daily	2-3 weeks	water
<i>Shatavari Churna</i>	3-6 gm	After meal/ thrice daily	2-3 weeks	water
<i>Rasayana Churna</i>	3-6 gm	After meal/ thrice daily	2-3 weeks	water
<i>Bhumyamalaki Churna</i>	3-6 gm	After meal/ thrice daily	2-3 weeks	water
<i>Gokshuradi Guggulu</i>	1-2 Vati	After meal/ thrice daily	2-3 weeks	water
<i>Punarnavashtaka Kwatha</i>	20-40 ml	After meal/ thrice daily	2-3 weeks	-
<i>Varunadi Kwatha</i>	20-40 ml	After meal/ thrice daily	2-3 weeks	-
<i>Shigru Kwatha</i>	20-40 ml	After meal/ thrice daily	2-3 weeks	-
<i>Trinapanchamula Kwatha</i>	20-40 ml	After meal/ thrice daily	2-3 weeks	-
<i>Shilajityadi Vati</i>	1-2 Vati	After meal/ thrice daily	2-3 weeks	water
<i>Shuddha Shilajatu Powder</i>	2-3 gm	After meal/ thrice daily	2-3 weeks	warm milk
<i>Vastyamayantaka Ghrita</i>	5-10 ml	On empty stomach/ twice a day	2-3 weeks	warm milk

Other Ayurvedic formulations recommended in CKD and/or accompanying conditions-

- In CRF - *Punarnavadi* compound- 3-5 gm after meal/thrice daily with water. (Contents- *Punarnava root* + *Gokshura seed* + *Varuna Bark* + *Shigru Bark* + *Kandekshu root* + *Guduchi Stem* + *Shatavari root* + *Shuddha Shilajit* each 1 part + *Kusha Root* 2 part).^[20]
- In CRF/ESRD- In severe anaemia - *Raktabasti* – 60 ml blood for two times in 48 hours.^[21]

- Increased blood urea and urine albumin level- *Niruha Basti* (Medicated Decoction based Enema Therapy) by *Punarnavadi Kwatha* ^[22] daily with oral medicine- *Gokshuradi Guggulu*, *Rasayana Churna*, *Varunadi Kwatha* for 1 month.^[23]
- CKD with urinary infection- *Chandanasava*- 10-20 ml twice a day just after meal.^[24]
- Nephroprotective agents present in *Nagaradi Kashaya* (*Chakradatta-28*), *Ashmarihara Kashaya* (*Siddha Yoga Sangraha-18*).^[25]
- To improve renal function - *Punarnavadi Ksheera Basti* and *Punarnavadi Kwatha*.^[26]
- 1. *Gokshuradi Guggulu* (Ayurvedic compound preparation: *Gokshura*, *Guggulu*, *Triphala*, *Trikatu*, *Musta*) – 1 gm, 3 times in a day after food with warm water.
2. *Varunadi Kwatha* (ingredients: *Varuna Tvak*, *Bilva Moola*, *Apamarga*, *Chitrak Moola*, *Arani*, *Shigru*, *Bruhati*, *Kirattikta*, *Karanja*, *Shatavari*) – 40 ml 2 times in a day after food.
3. *Bhumyamalaki (Tamalaki Rasayana)- Phyllanthus urinaria* tablet – 1 gm, 2 times in a day after food with water.
4. *Uricare- Shilajatu, Guggulu, Guduchi, Gokshura* tablet– 1 gm, 3 times in a day after food with warm water.
5. *Niruha Basti* with *Punarnavadi Kwatha* (decoction) in the morning, before one hour of the lunch.^[27]
- For nephroprotective, hepatoprotective and diuretic activities: **-Kala Basti-** ^[28] *Anuvasanavasti* was administered with *Varunadi Ghrita* and *Manijisthadi Taila* - each 40 ml. **-Niruha Basti** is a combination of the following drugs:
 - 1- *Gudapaka*- 600 ml
 2. *Saindhava lavana*- 6 gm
 3. *Sneha-Varunadi Ghrita* and *Triphaladi Taila*- 40 ml each
 4. *Kalka- Guduchi, Punarnava, Goksura* and *Manjistha*- 5 gm
 5. *Kasaya- Punarnavastaka Kashaya*- 200 ml

Among the above ones, *Gokshura (Tribulus terrestris)*, *Guduchi (Tinospora cordifolia)*, *Manjistha (Rubia cordifolia)* and *Punarnava (Boerhavia diffusa)* are *mutrala* (diuretic) drugs. Among this, *Gokshura* is having chemical constituent chlorogenin, diosgenin, gitogenin, rutin, campesterol, beta-sitosterol, stigmasterol as well as the properties of nephroprotective, hepatoprotective and diuretic activities.^[28]
- For *Mutraghata- Guduchyadi Modaka, Gokshuradi Guggulu, Dadima Ghrita, Nyagrodhadi Churna, Kalyana Kshara, Chandraprabha Vati, Yogendra Rasa*.^[29]
 - *Palashah Pushpashava*- 15-20 ml twice a day (in *Vrikka Shotha*).^[30]
 - *Mutrala Kashaya Churna*- 24 gm thrice a day, with *Shuddha Shilajatu* 625 mg or *Ksharparpati* 500-1250 mg (in *Sarvanga Shotha* due to CKD).^[31]

- *Maheshvara Vati*- 60-120 mg twice a day with honey (*Vrikka roga/ Vrikka shotha*).^[32]
- **Vrikka Shotha-**
 - *Tamra parpati*- 125-250 mg thrice a day with *Eranda Taila (Mutraghata)*
 - *Chandraprabha Vati*- 2-4 tab twice a day with *Sheetal Mircha + Gokshura Kwatha (Mutraghata+Mutrakrichha)*.
- **Vrikka Vrana-** *Vangabhashma- + Shilajeet + Giloya Satva* (each 375 mg) + *Mishri* 1125 mg twice a day with *Madhu*.
- **Vrikka Vidradhi-** *Lokanatha Ras* – 125-250 mg twice a day with *Madhu*.
- **Vrikka Shoola-**
 - *Sheetal Parpati*- 750 mg- 1500mg, at morning, with *Jeeraka* powder + normal water.^[33]
 - *Trivikrama Rasa*- 250 mg twice a day with *Madhu (Mutrakrichha)*.^[34]

3) *Pathya-Apathya (congenial-incongenials)* ^[35]

Pathya Aahara: Food items prepared mainly from rice or rice flour, *Moong Daal*, fresh and easy to digest cooked vegetables with less/no salt, apple, grapes, dates (except in diabetic nephropathy) and papaya, and parched rice are good. Rock salt in limited amount is preferred. Patients can take one or two *Chapati* made of barley flour in a day. Sesame oil and cow ghee are to be used in small quantity but other cooking fats are to be avoided.

Pathya Vihara: Timely meals, restricted intake of water and proper following of daily regimen.

Apathya Ahara: All other flour items (i.e., wheat, millet, corn), bakery items, all oils except sesame, junk food, fermented items, salts, all the items having sour taste, chillies, deep fried items, milk products and vegetables with slimy properties (brinjal, ladies finger etc.), non-vegetarian foods. Restrict salty, fried, spicy, heavy and oily food items.

Apathya Vihara: Excessive physical and mental stress, day sleep and night vigil.

4) *Rasayana* drugs

List of *Rasayana* drugs which may be used for either for prevention or management of the disease.

- *Rasayana Churna* (equal quantity of *Guduchi, Gokshura* and *Amalaki Churna*) 3 gm thrice a day, with water.
- *Bhumyamalaki Churna* 3 gm, thrice a day with water.
- *Punarnava, Guduchi, Gokshura, Shatavari, Shilajit* used come under the list of *Rasayana* drugs. Especially *Punarnava, Gokshura, Shilajit* are recommended exclusively in the disorders of *Mootravaha Samsthana*. These drugs should be accepted as *Naimittika Rasayana* for Kidney and other organs of *Mootravah Srotas*. These drugs by their virtue of *Rasayana* properties

increase in *Jatharagni*, quantity and quality of sleep, sense of well being, increase in functional capacity along with decrease in disease features up to certain extent. Modern researches have shown ample evidence that *Ayurveda Rasayana* drugs bear the property of antioxidant and work as free radical scavengers. Even plenty of research works through *invivo* and *invitro* studies have supported the rich anti-oxidant activity and free radical scavenging properties present in these drugs. *Bhumyamalaki (Tamalaki Rasayan)* is a traditional medicinal plant that contains tannins and flavonoids, both being active antioxidants. Apart from this it showed improvement in renal conditions by supporting the regenerative capability of the renal tubules.^[36]

- *Rasayana* for overall health: *Guduchi, Amalaki, Ashwagandha*, cow's milk and *Takra*.^[37]

4) Special Cautions

- If the patient is already on maintenance dialysis, it is to be continued. The frequency of dialysis is to be reduced according to improvement in the patient's general condition and renal function.
- Patient not responding with above mentioned regimen are to be referred to higher centers having facility of dialysis.^[18]

CONCLUSION

Ayurveda, the holistic Indian system of medicine always provides a ray of hope in prevention of disease and promotion of health. There is a great deal of historical information about the drugs and plants used in chronic kidney diseases and some scientific evidences too are now available in their support. *Ayurvedic* texts have descriptions of treatments for renal ailments that can be used to protect nephrons and even stimulate regeneration in CKD. Fluorosis is an important cause of CKD in fluorosis endemic areas. *Ayurvedic* drugs and therapies useful in CKD can be effectively used in management of fluorosis induced CKD. However studies on scientific parameters are required to affirm this study.

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