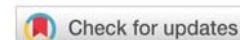


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## Research Article

# Clay soil chronic kidney failure in Vidharbha region of Maharashtra state

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## Abstract

**Background:** Chronic Kidney Diseases (CKD) is not uncommon in farmers working in a clay soil land in Buldana, amarvati and Akola districts called *kharpan patta* Maharashtra state India. We surveyed incidence of CKD in 246 villages.

**Methods and patients:** We visited the villages where CKD farmers are reported to media or news papers or reported in literature. Details were discussed with heads of village. On previous day of visit evening announced by head of villages the information regarding those families with history CKD, other kidney problems or if any suspicions of CKD or member died of CKD, all the family members are invited for clinical examination, with available reports of CKD patients. Clinically suspected or known CKD patient's blood, urine, drinking water and soil were investigated for content of heavy metals. The pesticide and manure used for farming were also studied

**Results:** Total 21,006 villagers from 246 villages were surveyed for CKD of a clay soil region. 372(18/10000), 497(214/1000), 1559(74/1000), 150(7.1/1000) had CKD, renal calculi, impending renal failure and died respectively. Sixty patients were investigated of these forty had raised serum creatinine of 1.7-11mg/dl (mean 4.94). lead, copper, cadmium were present in urine, blood, drinking water and soil. lead and copper content pesticides are routinely sprayed on crops. Cadmium contaminated phosphate manure are sprayed over crops for to increased yield. Cadmium adsorbed over clay soil and released in drinking source of water, lead percolated in soil to drinking water.

**Interpretation:** Clay soil responsible for CKD in farmers. Drinking water sources are contaminated with cadmium and lead responsible for CKD in clay soil region.

## Introduction

India is an agriculture country. Farming is main occupation of 70% of Indian population staying at villages. Chronic kidney disease in farmers and villagers remains a mystery. Yearly income depends upon the yield of crops. To increase the yield farmers sprayed excessive toxic lead and copper containing pesticides and cadmium contaminated phosphate manures. Exposure to low environmental cadmium and lead may enhance the progressive kidney disease [1]. Routine used pesticides including organophosphate, organochlorine, carbamate and

pyrethroid insecticides and triazine, chlorophenoxy and herbicides known to cause kidney damage depends upon dose and duration of exposure [2]. In the year 2010 we reported 23 deaths due to CKD and 18 cases of impending CKD due to contamination of drinking water with lead, copper and cadmium from clay soil region of Maharashtra [3]. This is tip of iceberg of CKD due to heavy metals. High incidence of CKD in this clay soil called salty land region. Villagers felt that there is no cure of CKD, only transient improvement by recurrent dialysis. Because of expensive treatment many families are deserted, sold out their piece of land, ornaments and in



excessive debt result in suicide. Because of these myth villagers of this region refuse to undergo investigations including renal biopsy [3]. There was no scientific and political wish to study in details and find out the permanent solution except attending the funeral of young farmers died of CKD. Government of Maharashtra took cognize of the authors scientific report of contamination of drinking water by copper, lead and cadmium [3]. CKD is en result of Varies causes including heat and dehydration, pesticides and herbicides ,heavy metals including cadmium and lead, infections and chronic consumption of non steroidal anti-inflammatory agents [4]. We analyzed the lead, cadmium, copper in rock, drinking well water , blood and urine, hardness and solid content of drinking water. Result of surveyed 21006 population from 246 villages regarding incidence of chronic kidney failures, renal stone, suspected kidney disease and deaths in a clay soil region Buldana district of Maharashtra.

## Patients and methods

We analyzed 246 villages data from Buldana district were from repeated chronic kidney disease reported in news papers and also in previous report from same area [3]. Details history of drinking water, kidney disease in family members, and any death were recorded. History of undergoing any treatment for kidney disease, and renal stones. Patients with known DM, hypertension, nephritis, smokers are excluded from blood investigations. There is no any sex different found Details available investigations of serum creatinine, ultrasonography and urine examination were studied. It was very difficult to dig out details because kidney failure in this clay soil region was age old phenomenon and there is no curative treatment for their illness, while renal dialysis is the only improves survival but need regular expenses which not affordable. With many difficulties we succeeded to convince and obtained written consent of 60 patient are representative samples for blood and urine examination. Soil, drinking water from regular well was collected. Urine samples for heavy metal analysis obtained from CKD victims. Details of routine pesticides sprayed and manures used for crops were studied.

## Results

We analyzed the 21006 populations surveyed from 246 villages. 372(18/1000) had chronic kidney failure under the treatment of nephrologists at tertiary care hospitals, 497(24/1000) had recurrent renal colic and ultrasonography confirmed renal calcululi. However 1559(74/1000) showed recurrent rise in serum creatinine. 150(7.1/10000) died of renal failure.

## Discussion

We reported that the reason of chronic kidney failure and renal calculi in the region of clay soil area of Buladna district is due to higher than permissible levels of lead, copper, cadmium in drinking water sources, soil and rocks (Table 1). total hardness of drinking water from wells water >600 reported in 12.6% (10/79) and solid content >500 in 89.62% (55/79). Cotton is common crop in this region. Because of recurrent use of expensive newer pesticides, fungicides, herbicides due to resistant developed in bacterial , fungal and virus. To increase the yield every year farmers are spraying heavy and toxic newer pesticides. Pesticides and fungicides are rich sources of copper and lead. Cadmium containing phosphate manures and lead containing pesticides , fungicides are common source of contamination of drinking water in this clay soil , moreover cadmium adsorbed over clay soil and released in drinking water such as in open and bore wells [2,5,6]. Phosphate fertilizers contaminated with various impurities from phosphate rock and acid used to prepared cadmium, currently there is no commercial means to reduce or remove the cadmium from rocks rather than using low cadmium contaminated rock. Because of scarcity of agriculture's labors, farmer alternative select regularly spraying herbicides. Drinking water contaminated by herbicides, glyphosphate responsible for renal failure in farmers in Sri Lanka [7].

Lead is excreted very slowly release from body the biological half –life estimated at 10 years, result in chronic accumulation and toxicity. It suppresses the haemoglobin synthesis, cytochrome synthesis, steroid metabolism, cellular membrane integrity, active metabolites of vitamin. Anemia produced by lead enhances absorption of cadmium from intestine. Cadmium biological half-life is up to thirty years. It riches in highest concentration in renal tissue [8]. Exposure to lead stimulate oxidative stress, liberate free radicals, interference with calcium dependent enzymatic reaction leads to apoptosis. Lead reduces guanyle cycles which reduces cGMP in turn reduces nitric oxide as result of these combine cascade leads to renal injury [9]. In the year 1950, Japan recognized an relation between chronic kidney diseases and cadmium, result in rise in incidence of renal tubular dysfunction, chronic kidney disease and type of osteomalacia known as “itai-itai ,in women”. Details of renal failure due to cadmium. Cadmium, at higher levels of exposure (Table 2) as seen in present report is well established nephrotoxicant associated with chronic kidney disease [10]. It has been recognized that signs of early tubular damage may develop at relatively low cumulative doses of environmental cadmium [11].

**Table 1:** Showing the details analysis of blood, water, rocks for heavy metals.

Type of sample	Total number	Lead Normal <10ug/dl (average)	Copper Normal <5ug/dl	Cadmium Normal <1ug/dl	Hardness of water (normal 300-600PPM)	Solid content of water (n 500ppm)
Blood	40	25-126 (75.9)	10-30 (18.14)	5-34 (14.1)	-	-
Mud or rock	1	96	83.96	5	-	-
Well -1	1	119	23	8	680	680
Well 2	1	43	30	10	880	750
Urine	9	5-80 (35.16)	ND	6.4-15.1 (10.05)	-	-

ND: Not Done; Method: AES (inductively coupled plasma atomic emission spectrophotometer).

**Table 2:** Details of population studied for chronic kidney disease.

Total villages	246
Total population surveyed	21006
Chronic kidney failure	372 [18/1000]
Kidney stone	497 [24/1000]
Suspected kidney disease	1559 [74/1000]
Fatal	150 [7.1/1000]

Chronic kidney disease first noted in 1990 [12]. Similar chronic kidney disease have been reported in villagers of rural India including Andhra Pradesh, Odisha, Chhattisgarh and Maharashtra [3,13,14]. Uddanam nephropathy (name after the village in Andhra Pradesh) [15]. In addition to chronic kidney disease, 24/1000 cases had renal calculi. Hardness and solid content of drinking water contribute to chronic kidney diseases and renal calculi [16]. Government of Maharashtra took cognize of report of chronic kidney disease in clay soil region [3]. Since 2012 clay soil region provided cadmium, copper and lead free and palatable drinking water by reverse osmosis filter and harvesting of surface water. The reports of chronic kidney disease are scarce. Need reevaluation and resurvey of change in incidence of chronic kidney failure and renal calculi.

## Conclusion

Cadmium, lead, copper and hard water responsible of chronic kidney disease in clay soil region. Surface water or reverse osmosis filter prevent subsequent renal failure.

## Authors contribution

Himmatrao S Bawaskar and Pramodini H Bawaskar examined the patients and collected the samples and data.

Parag H bawaskar contacted laboratory and arranged sample delivery.

Pankaj H bawakar Council the villagers.

HSB and PHB wrote the initial draft.

Pa H Bawaskar edited the final version.

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