A Qualitative Study of Chronic Kidney Disease in Rural India, the Incidences of It, and How We Can Prevent It

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Abstract:

Chronic kidney disease (CKD) poses a significant health burden in rural areas of India, with environmental factors, overexertion, and limited access to healthcare contributing to its prevalence. This research article aims to explore the incidence of CKD in specific rural regions, identify its causes, and propose preventive strategies. Evidence from recent studies underscores the urgent need for interventions to improve access to clean water, enhance healthcare infrastructure, and promote patient education to mitigate the impact of CKD in rural communities.

Keywords:

chronic kidney disease, rural communities, India, incidence, prevention, groundwater.

Introduction:

Chronic kidney disease (CKD) is a global health issue, and its prevalence is particularly pronounced in rural areas of India. Environmental factors, inadequate access to healthcare services, and socioeconomic disparities exacerbate the burden of CKD in these communities. This article examines the incidence of CKD in rural India, explores its underlying causes, and discusses potential preventive measures to address this public health challenge.

Incidence and causes of CKD in Rural India:

Recent research indicates a high prevalence of CKD in rural areas of India. Several factors contribute to the development of CKD in rural India. Environmental pollution, including contamination of drinking water sources with heavy metals and agricultural chemicals, poses a significant risk to kidney health. Additionally, overexertion of the body due to manual labor, not drinking enough water due to the limited access to safe drinking water, inadequate patient education about kidney health, and a lack of healthcare facilities further exacerbate the prevalence of CKD in rural areas. According to epidemiological studies, the incidence of CKD is significantly higher in rural populations compared to urban areas. Factors such as poor water quality, agricultural pollutants, and occupational hazards contribute to the disproportionate burden of CKD in rural communities. This is most notably seen in the Srikakulam, Prakasam, Nellore districts of Andhra Pradesh and the Nalgonda district of Telangana. The primary economic factors of these largely rural districts are agricultural. These districts in their respective states are some of the driest regions in the nation and lack sufficient water resources however have a large population. Due to the lack of available water resources for drinking, the local population often resort to drilling for bore wells to tap into groundwater aquifers. The problem arises from this as this groundwater is often polluted with pesticides, minerals, and chemicals from nearby industrial drainage as well as agricultural chemical waste.

Due to the water being polluted, complications such as fluorosis and chronic kidney disease arise. The kidneys are strained not only due to the lack of water in these dry regions but also in the process of filtering the many minerals and chemicals mixed into the groundwater that these populations have a limited amount of. This immense stress on the kidneys over many many years results in Kidney failure as a last stage which causes many of the elderly in these rural areas to seek dialysis. An example of this is a patient by the name of Inturi Malakondaiah, a retired professor and entrepreneur. Mr. Inturi resided in the town of Kandukur located in the Prakasam district of Andhra Pradesh. This drought stricken region lacked basic water facilities as there were no rivers or irrigation projects available anywhere near. Because of this the local population of the town and surroundings relied completely on ground water which was also limited in availability. Water was scarce and barely enough for locals to survive upon. Reliance on groundwater would end up causing long term problems. A study by the Nature Environment and Pollution Technology journal claimed that Physico-chemical characteristics of groundwater collected from Kandukur had a Water Quality Index of 138. 0-24 being excellent, 25-49 being good, 50-74 being poor, 75-100 being very poor, and greater than 100 being unfit for drinking. Because of the water being unfit for drinking, this patient suffered kidney related complications from the age of 50 till his passing. While struggling with the issue of developing chronic disease was a problem, gaining access to adequate health care facilities was another problem. A lack of a good hospital in a town of 70,000 caused many patients to make the 2 hour journey to the closest small city. For dialysis patients such as Mr. Inturi, this was often a pain.

Causes deeply examined:

Heavy Metal Toxicity: Water contaminated with heavy metals such as lead, arsenic, cadmium, and mercury can lead to kidney cell damage. These metals can accumulate in the kidneys over time, causing oxidative stress, inflammation, and apoptosis (cell death) in renal cells.

Chemical Contaminants: Chemical pollutants present in water, such as pesticides, industrial chemicals, and disinfection by-products, can adversely affect kidney cells. Exposure to these chemicals can disrupt cellular processes, impair renal function, and increase the risk of kidney disease.

Microbial Pathogens: Waterborne microbial pathogens, including bacteria, viruses, and parasites, can cause infections in the kidneys and damage renal cells. Infections such as urinary tract infections (UTIs) can lead to inflammation, tissue damage, and loss of kidney function if left untreated.

Nephrotoxic Substances: Certain substances found in water, such as chlorinated solvents, hydrocarbons, and pharmaceutical residues, have nephrotoxic properties, meaning they can directly damage kidney cells. Prolonged exposure to nephrotoxic substances can lead to tubular injury, glomerular dysfunction, and chronic kidney disease.

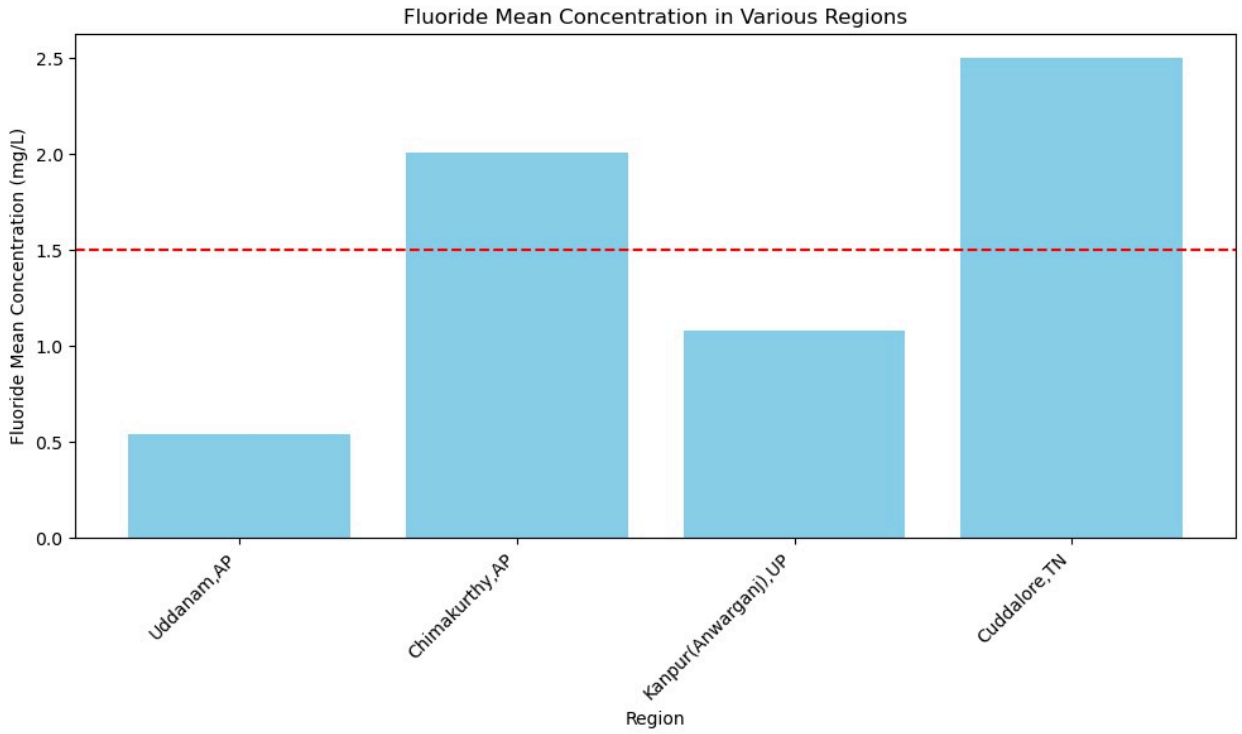
Endocrine Disruptors: Water contaminants with endocrine-disrupting properties, such as bisphenol A (BPA) and phthalates, can interfere with hormonal regulation in the body, including renal function. These compounds may disrupt kidney cell signaling pathways, hormone production, and fluid-electrolyte balance, leading to renal dysfunction over time.

Methodology

Examine the relationship between water quality and Chronic Kidney Disease (CKD) prevalence in India, using data from the national CKD registry and water quality reports. Match data spatially and conduct a thematic analysis of CKD prevalence and water quality. Identify high CKD regions with poor water quality and find correlations between poor water quality and CKD.

Results

Results are presented in the form of a graph.



Discussion

In the data presented we have selected specific regions that are high in chronic kidney disease and analyzed factors such as water quality which are a major cause for CKD. Above we were able to collect the mean fluoride concentrations in select regions. The data is approximated published data as the endemic nephropathy in Southern India is very limited, with clinical reviews, quoting data from an unpublished abstract. In the select regions the exact quantity of Silica is unknown but studies found that it was well above a healthy amount. The correlation between such regions with high incidences of CKD include poor water quality due to high concentration of minerals such as silica, phosphorus, and fluoride.

Prevention Strategies

To address the growing burden of CKD in rural India, comprehensive prevention strategies are imperative. Key interventions include:

- Accessibility to Clean Water: Implementing measures to ensure access to safe and clean drinking water is essential for preventing waterborne diseases and reducing the risk of CKD. This can be done by governments investing in drinking water projects, decreasing the dependence on ground water in drought stricken areas. Such water projects work by directing water from reservoirs from fresh water rivers and transporting them to tanks in drought stricken areas through lift projects. Water purification plants must also be built to provide clean drinking water to rural communities. An abundance of water in rural communities will allow the population to drink clean and safe water, allowing them to maintain satisfactory kidney condition.
- Regular Health Checkups: Regular health assessments can track the impact of environmental factors such as water quality on kidney health as well. Regular monitoring of blood pressure is important as an increase in blood pressure is often the result of kidney damage. Detecting CKD through regular health checkups can ensure that patients receive treatment at early stages which is more effective.
- Development of Research Facilities and Hospitals: Investing in healthcare infrastructure, including the establishment of research facilities and hospitals in rural areas, is critical for early detection, diagnosis, and management of CKD. In every town with a population of 40,000 or greater, establishing a super speciality hospital and kidney research center will be sufficient to cover most of the affected regions. This will help patients get treatment effectively and efficiently.
- Increase Government Spending: Governments at both the national and state levels should allocate adequate resources to improve healthcare services, implement preventive measures, and promote public awareness campaigns about CKD prevention and management. Governments should Invest in creating specialized dialysis centers for patients where CKD is most common. Allocating funds for creating health care infrastructure as well as drinking water infrastructure is important.
- Increase Patient Education: Enhancing patient education programs to raise awareness about the risk factors, symptoms, and preventive measures for CKD is essential. Empowering individuals with knowledge about healthy lifestyle choices and early detection can help reduce the incidence of CKD and improve overall kidney health in rural communities. Many patients do not understand the consequences of being overworked without drinking enough water, which causes a strain on their kidneys. Teaching rural communities the importance of maintaining their good health will prevent troubles later on.

Conclusion

Chronic kidney disease represents a significant health challenge in rural areas of India, with environmental factors, occupational hazards, and limited access to healthcare services contributing to its prevalence. Addressing the root causes of CKD and implementing preventive strategies are essential steps toward reducing the burden of this disease in rural communities. By prioritizing access to clean water, improving healthcare infrastructure, increasing government spending, and

promoting patient education, it is possible to combat CKD and improve kidney health outcomes in rural India.

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