

# Effect of Ground Water Contamination on Heart and Skin Disease in a Village of Greater Noida

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## Abstract

A detailed investigation conducted in the rural regions of Greater Noida, India, revealed the profound impact of water contamination on the prevalence of heart and skin diseases in 27 families surveyed. The study revealed that inadequate sanitation, marked by overflowing household waste, scattered litter, and hidden drainage systems, played a significant role in polluting water sources, thereby increasing disease susceptibility. Furthermore, established cultural practices, such as alcohol consumption and tobacco use, increased the health risks associated with these conditions. Although there was some level of awareness regarding the potential health hazards, the findings emphasized an urgent need for improved water quality, lifestyle modifications, and targeted health interventions to lower disease incidence. The research has far-reaching implications for public health policies, stressing the importance of comprehensive strategies that address environmental, behavioral, and health-related factors to mitigate disease risks in rural India. By prioritizing water quality improvements and encouraging community-driven initiatives, healthier and more resilient communities can be developed.

## I. Introduction

Groundwater serves a range of vital functions, such as supporting household needs, agriculture, and industrial processes. It also represents one of the most significant sources of fresh water worldwide, providing drinking water to almost one-third of the global population (International Association of Hydrogeologists, 2020). In arid and semi-arid regions with limited surface water and low precipitation, groundwater becomes an invaluable asset (Li et al., 2017). A critical factor for the sustainable development of a nation is the assurance of a dependable and renewable Ground water used for drinking.

The contamination of groundwater with metals like Lead (Pb), Chromium (Cr), Arsenic (As), etc, presents a significant global public health challenges. High levels of metal arsenic exposure in groundwater (ranging from 100 to 1000 µg/L or more) are linked to various severe health risks, including skin disorders, cardiovascular diseases, respiratory problems, gastrointestinal issues, liver and splenic diseases, kidney and bladder

conditions, reproductive failure, neurotoxicity, and cancer. In contrast, studies focusing on the health impacts of low-level exposure to arsenic, cadmium, zinc, manganese, copper, nickel, chromium, and mercury are considerably less frequent.

Environmental factors primarily contribute to cardiovascular disease, with lifestyle choices such as smoking and diet often highlighted. However, the impact of chemical contaminants is less well understood. Research has shown a strong association between high rates of cardiovascular mortality and exposure to air pollution, particularly fine particulate matter. Further studies indicated a significant link between air pollution and heart failure, arrhythmias, and ischemic heart disease. Animal studies suggested that polluted air may lead to increased blood clotting and plaque buildup in the arteries (Bhatnagar et al., 2006).

Due to its sensitivity to arsenic, skin lesions often represent the initial symptoms of chronic exposure. A study conducted in Southern Sindh, Pakistan, from 2005 to 2007 explored the health impacts of drinking water contaminated with arsenic, particularly focusing on skin conditions such as keratosis and melanosis in communities near Manchar Lake. The results indicated that 61 to 73 percent of the villagers had experienced chronic arsenic exposure (Jamali et al., 2009). A total of ten studies focused on skin cancer and fifteen studies on skin lesions were found. There is a clear link between elevated arsenic levels in water and the occurrence of skin lesions, even with low to moderate exposure. Despite variations in how exposure is defined, larger studies on specific skin cancers, such as squamous cell and basal cell carcinomas, have also shown a dose-response relationship in risk. Additionally, genetic factors may affect the ability of body to metabolize arsenic, thereby influencing the likelihood of developing skin lesions. Overall, growing evidence indicates that arsenic exposure can elevate the risk of skin conditions and cancers at previously deemed acceptable levels and that genetic factors may play a significant role in this increased risk of causing disease (Ahsan et al., 2015).

Significant health risks are associated with heavy metals such as lead, arsenic, cadmium, zinc,

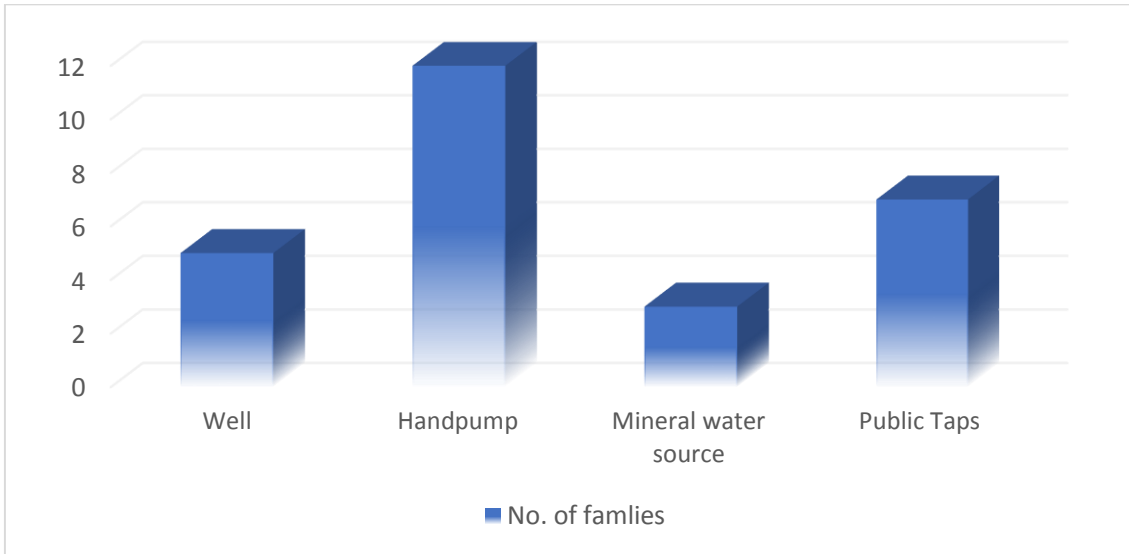
manganese, copper, nickel, chromium, and mercury. Despite the well-known dangers, many individuals in developing countries continue to be exposed to these metals. Cadmium, which occurs in trace amounts in coal and rocks, can pollute surface and groundwater as a result of industrial waste. This metal is linked to several health issues, including anemia, high blood pressure, liver and kidney damage, and the displacement of zinc in the body. The rising contamination levels of cadmium are exacerbated by its frequent disposal in landfills instead of proper recycling (Seth et al., 2014). Along with eight other studies for context, thirteen cohort and case-control studies were analyzed. Among these, a cohort study conducted in Bangladesh revealed the most compelling evidence, suggesting that a concentration of 100 µg/L of arsenic is considered a safe limit for drinking water. When factoring in local water and food consumption, this translates to a daily intake of 0.009 mg/kg. The study population was likely more sensitive to harmful effects due to nutritional deficiencies (Alexander et al., 2014). Research indicates that metal pollution may contribute to the onset of atherosclerosis and other heart-related issues. Interestingly, a recent clinical trial utilizing a metal chelator showed a surprising benefit a reduction in cardiovascular events among patients with prior heart conditions. This finding further strengthens the connection between metal exposure and cardiovascular disease (CVD). Understanding how these pollutants affect heart health can aid in identifying critical risk factors and improving cardiovascular disease prevention strategies (Gullar et al., 2005). There is a well-established correlation between skin problems and drinking water contaminated with arsenic. Researchers have explored the impact of environmental arsenic and its geological origins on skin health. The study highlights the importance of understanding the environmental factors contributing to these health challenges by emphasizing the relationship between arsenic exposure in drinking water and various skin conditions (Baris et al., 2005).

## II. Methodology

A detailed study focused on rural communities in Greater Noida, India, aimed to examine the risk factors associated with heart and skin diseases. This research, which included a survey of 27 families, uncovered the profound effect of contaminated water on the incidence of these health issues. Poor sanitation practices, characterized by the presence of overflowing waste, litter, and hidden drainage systems, contributed to the pollution of water sources, thereby heightening the risk of heart and skin diseases. In addition, the investigation highlighted that cultural traditions such as alcohol consumption and tobacco chewing, which are deeply rooted in the local community, intensified the risks linked to these health conditions. Although there was some awareness regarding the health hazards, the results pointed to an urgent need for enhancements in water quality, lifestyle adjustments, and focused interventions to reduce the prevalence of these diseases. The research underscored the intricate relationship between environmental and behavioural factors affecting the likelihood of heart and skin diseases in rural settings, stressing the importance of addressing contaminated water as a key element in this multifaceted scenario. By exploring this topic, communities in Greater Noida can take significant actions towards alleviating the impact of heart and skin diseases and fostering overall health among their inhabitants.

## III. Results and Discussions

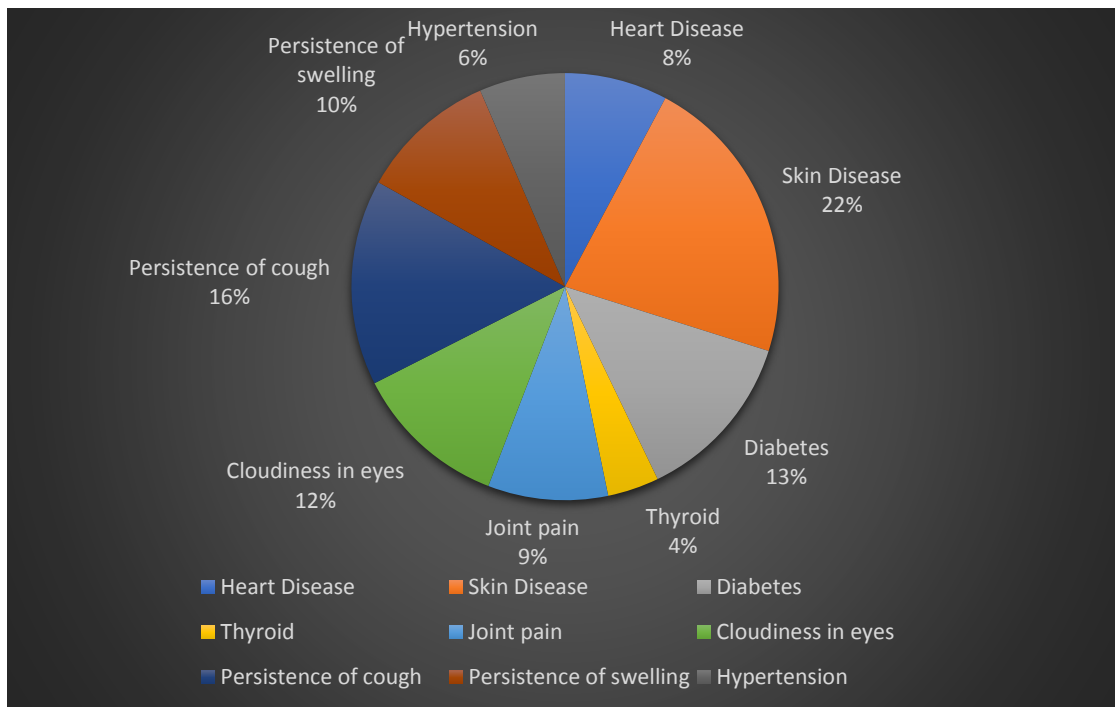
The handpump (groundwater) is the primary water source for 12 families, making it the most widely used option. Public taps serve as another important source, utilized by 8 families. In contrast, wells and mineral water sources are less popular, relied upon by only 6 and 4 families, respectively. This data highlights a clear preference for handpumps and public taps as the main water sources, while fewer families depend on wells and mineral water.



**Figure 1: Sources of drinking water**

Skin diseases rank as the most common health issue, impacting 22% of the population. Other notable conditions include chronic cough at 16% and diabetes at 13%. Thyroid disorders, affecting 4%, and hypertension, which impacts 6%, are

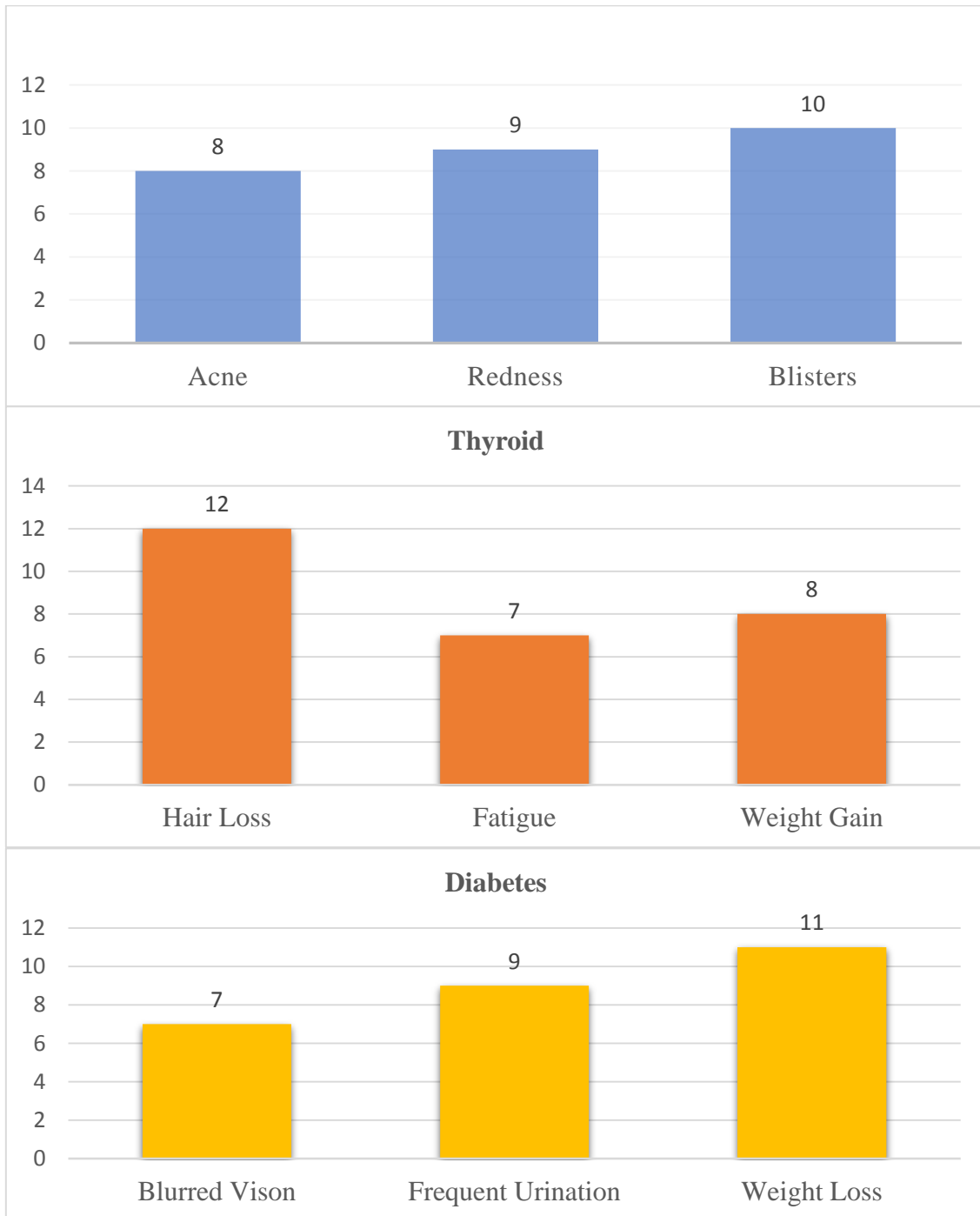
among the least common conditions. This distribution highlights a diverse health landscape, where skin and respiratory conditions are more frequent, while endocrine-related issues are less prevalent.



**Figure 2: Dispersion of Health Conditions Among Population**

Blisters were the most frequently observed symptom in people with skin conditions, while redness and acne were also widespread. Hair loss stands out as the most common symptom linked to thyroid disorders, with weight gain and fatigue following closely. In the case of diabetes, weight loss is the primary symptom, along with a

considerable number of individuals reporting frequent urination and blurred vision. This pattern underscores the different levels of symptom severity and occurrence across these health issues, highlighting the necessity for tailored management strategies for each symptom.



**Figure 3: The frequency of Symptoms Associated with Skin Disease, Thyroid, and Diabetes**

#### IV. Conclusion

The results clearly demonstrated the vital connection between polluted water, inadequate sanitation, and the high rates of heart and skin diseases in rural Greater Noida, India. This research sheds light on the intricate interactions among environmental, behavioural and social factors that heighten disease risk. While there is some awareness of the health hazards, the urgency for action is evident. Enhancing water quality,

improving sanitation facilities, and encouraging lifestyle changes are essential steps to reduce disease occurrences. By emphasizing these strategies, communities can substantially alleviate the incidence of heart and skin diseases, thereby enhancing overall health and resilience. The implications of this study are significant for rural India, underscoring the necessity for a holistic strategy to tackle the complex relationships between environment, behaviour, and health.

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