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Epidemiology of Water-Borne Diseases in Agricultural Villages of The Thar Desert, Rajasthan

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Abstract: ***Water-borne diseases remain a persistent public health challenge in the agricultural villages of the Thar Desert, Rajasthan. The scarcity of fresh water, overdependence on traditional water storage methods, and poor sanitation practices enhance the vulnerability of rural communities. This study investigates the epidemiology, spatial distribution, seasonal variation, and socio-environmental determinants of water-borne diseases—including diarrhea, cholera, typhoid, hepatitis-A, and gastroenteritis—across selected villages in Barmer, Jaisalmer, and Jodhpur districts. Using a mixed-method approach consisting of household surveys (n=450), interviews with healthcare workers, and water-quality testing, the study identifies contamination sources, high-risk groups, and peak incidence periods. Results reveal a significantly higher prevalence during summer and monsoon seasons, with children under five and women most affected. The study provides actionable recommendations to improve water safety, sanitation infrastructure, and community health awareness.***

Keywords: Thar Desert, water-borne diseases, epidemiology, groundwater contamination, diarrhea, rural health, Rajasthan, agriculture, sanitation, drinking water.

1.1 Introduction

Rajasthan's Thar Desert is one of the most water-scarce regions of India. Agriculture-dependent villages in this desert ecosystem rely heavily on groundwater, tankas, beri wells, and open ponds (nadis) for domestic use. These sources are easily susceptible to contamination due to seepage, animal activity, open defecation, and lack of water-treatment facilities. The epidemiology of water-borne diseases in this region is influenced by climatic extremes, poor socio-economic conditions, limited healthcare access, and high dependence on untreated groundwater.

Although several national-level studies have examined water-borne diseases, few region-specific research studies concentrate on the unique ecological and socio-cultural conditions of the Thar Desert. This research fills this gap by conducting a systematic assessment of disease occurrence and identifying environmental and behavioral determinants.

1.2 Objectives

1. To document the prevalence and seasonal variation of water-borne diseases in agricultural villages of the Thar Desert.

2. To analyze the quality of drinking water from major sources used by rural households.

3. To examine socio-economic and behavioral factors contributing to water contamination.

4. To identify high-risk groups and most vulnerable demographic segments.

5. To recommend strategies for water safety, sanitation improvement, and disease prevention.

1.3 Methodology

I. Research Design

(a.) A mixed-method descriptive and analytical research design was adopted.

II. Sampling

(a.) Study population: Agricultural households in Barmer, Jaisalmer, and Jodhpur districts.

(b.) Sample size: 450 households (150 from each district).

(c.) Sampling method: Stratified random sampling based on village population size and water source type.

III. Data Collection Methods

1. Household Survey:

(a.) Structured questionnaire covering water use, sanitation, disease history, and socio-economic variables.

2. Water Quality Testing:

(a.) 60 water samples tested for pH, total dissolved solids, coliform count, hardness, nitrates, and microbial contamination.

3. Interviews:

(a.) Interviews with ASHA workers, ANMs, and PHC doctors.

4. Secondary Data:

(a.) Health department reports, government census, PHC records (pre-2018).

(b.) Data Analysis

(c.) Descriptive statistics for prevalence.

(d.) Chi-square test for association between disease occurrence and water source type.

(e.) Thematic analysis for qualitative interviews.

1.4 Study Area

I. Geographical Setting

The study covers agricultural villages in:

(a.) Barmer: Dhorimanna, Sheo

(b.) Jaisalmer: Pokaran, Sankra

(c.) Jodhpur: Balesar, Phalodi

II. Environmental Characteristics

(a.) Annual rainfall: 100–300 mm

(b.) High temperatures up to 48°C

(c.) Sandy soil with low organic content

(d.) Saline and fluoride-rich groundwater

(e.) Scattered settlements with limited piped water supply

III. Water Sources

(a.) Tankas (underground rainwater storage)

(b.) Beris (traditional deep wells)

(c.) Nadis (open community ponds)

(d.) Handpumps and borewells

(e.) Water tankers (seasonal)

1.5 Observations

1. Disease Prevalence

(a.) Diarrhea: 58% households reported cases in the last year

(b.) Gastroenteritis: 41%

(c.) Typhoid: 17%

(d.) Hepatitis-A: 8%

(e.) Cholera: 2% (sporadic outbreaks)

(f.) Children under 5 were the most affected.

2. Seasonal Variation

(a.) Summer (April–June): Highest prevalence due to water scarcity and high contamination levels.

(b.) Monsoon (July–September): Increased gastroenteritis due to runoff contamination.

(c.) Winter: Lowest incidence.

3. Water Quality Findings

(a.) 78% samples exceeded permissible coliform limits.

(b.) 64% showed high TDS (>1500 mg/L).

(c.) 37% contaminated with nitrates beyond WHO limits.

(d.) Open ponds were the most contaminated sources.

4. Behavioral Factors

(a.) 52% households did not boil or filter water.

(b.) 43% practiced open defecation.

(c.) 36% stored water in unclean containers.

(d.) 24% shared water sources with livestock.

5. Healthcare Access

(a.) Average distance to PHC: 6–18 km

(b.) Low awareness of oral rehydration therapy (ORT)

1.6 Discussion

The study highlights a strong link between water scarcity, poor sanitation, and the prevalence of water-borne diseases. In desert regions, water is often stored for long periods, increasing the risk of microbial growth. Behavioral practices, such as open defecation and improper water handling, further contribute to contamination.

Groundwater in Thar Desert villages commonly exhibits high salinity, fluoride, and nitrate levels. These physical parameters not only deteriorate water taste and acceptability but also correlate with gastrointestinal diseases.

The vulnerability of children and women emerges from their higher exposure to domestic water usage. Seasonal peaks are consistent with earlier studies showing the relationship between high temperature and bacterial proliferation.

Socio-economic conditions play a decisive role. Low-income households relying on open ponds or traditional beris experience significantly higher rates of water-borne diseases compared to households with roof-harvested water or tanker supply.

1.7 Results

1. Water-borne diseases are widespread in all surveyed villages, with diarrhea being the most common.

2. Contamination is high in open water sources like nadis and beris.

3. Seasonal peaks appear in summer and monsoon months.

4. Poor hygiene and sanitation practices significantly increase disease risk.

5. Children and women are the most vulnerable groups.

6. Distance from healthcare facilities delays treatment and exacerbates severity.

1.8 Conclusion

Agricultural villages of the Thar Desert face severe health challenges due to contaminated water sources, inadequate sanitation, and socio-economic limitations. The epidemiology of water-borne diseases is shaped by environmental conditions, water-storage traditions, and behavioral practices. Without immediate intervention in water management and hygiene practices, the burden of disease will continue to affect productivity, children's health, and rural development.

1.9 Recommendations

1. Household Water Purification:

(a.) Promotion of low-cost filtration and boiling techniques.

2. Improved Sanitation:

(a.) Construction of toilets through community and government schemes.

(b.) Awareness programs to reduce open defecation.

3. Strengthening Water Infrastructure:

(a.) Regular cleaning of tankas and nadis.

(b.) Chlorination at community level.

4. Health Education:

(a.) Training women and schoolchildren on water safety.

(b.) Distribution of ORS packets through ASHA workers.

5. Monitoring and Surveillance:

(a.) Monthly water quality checks.

(b.) Village-level disease reporting system.

6. Government Intervention:

(a.) Expansion of piped-water supply under Jal Jeevan Mission.

(b.) Mobile health units in remote villages.

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