



Awareness, Attitudes and Practices Regarding Underground Water Recharge Among Urban and Rural Residents of Selected Districts of Madhya Pradesh: A Community-Based Cross-Sectional Study

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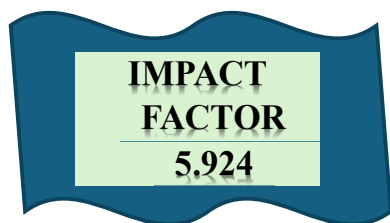
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Abstract

Background

Groundwater serves as a major source of drinking, domestic, agricultural, and industrial water in India. Rapid urbanization, increasing population, excessive groundwater extraction, and changing climatic conditions have led to a significant decline in groundwater levels. Public awareness and participation are essential for sustainable groundwater management and recharge.

Objectives

To assess the knowledge, attitudes, and practices regarding underground water recharge among urban and rural residents of selected districts of Madhya Pradesh and to evaluate their willingness to participate in groundwater conservation activities.

Methods

A community-based cross-sectional study was conducted from November 2025 to April 2026 among 600 adults residing in urban and rural areas of Indore, Bhopal, and Sagar districts of Madhya Pradesh. Data were collected using a pre-designed and pre-tested semi-structured questionnaire. Statistical analysis was performed using SPSS version 26.

Results

Among the 600 participants, 88.3% were aware of groundwater depletion, while 82.5% had heard about rainwater harvesting. Approximately 76.2% believed groundwater conservation was a collective responsibility. However, only 34.7% reported implementing groundwater recharge measures at their homes. Nearly 79.5% expressed willingness to participate in future groundwater recharge initiatives.

Conclusion

Although awareness regarding groundwater recharge was relatively high, practical implementation remained inadequate. Community-based interventions, awareness campaigns, and policy



support are required to translate knowledge into action and ensure long-term groundwater sustainability.

Keywords

Groundwater recharge, rainwater harvesting, water conservation, awareness, community participation, Madhya Pradesh.

Introduction

Water is one of the most valuable natural resources and forms the basis of human survival, agriculture, industry, and ecological balance. Groundwater constitutes a significant proportion of the world's freshwater reserves and serves as a primary source of drinking water for millions of people. In India, groundwater contributes substantially to domestic consumption, irrigation, and industrial activities.

Over the last few decades, increasing population growth, urbanization, industrialization, and unsustainable extraction practices have resulted in depletion of groundwater resources. Many regions of India are experiencing declining water tables, seasonal water scarcity, and deterioration in groundwater quality.

Groundwater recharge refers to the process by which water from precipitation, rivers, lakes, and other sources infiltrates into the soil and replenishes underground aquifers. Artificial recharge methods such as recharge pits, percolation tanks, rooftop rainwater harvesting systems, and recharge wells have emerged as effective approaches for restoring groundwater reserves.

Despite numerous government initiatives promoting rainwater harvesting and groundwater conservation, community participation remains limited. Understanding public awareness, attitudes, and practices related to groundwater recharge is essential for developing effective interventions.

The present study was undertaken to assess the awareness, attitudes, and practices regarding underground water recharge among residents of selected districts of Madhya Pradesh.

Objectives**General Objective**

To assess awareness, attitudes, and practices regarding underground water recharge among urban and rural populations of selected districts of Madhya Pradesh.

Specific Objectives

1. To assess knowledge regarding groundwater depletion and recharge.
2. To evaluate attitudes toward groundwater conservation.
3. To identify existing groundwater recharge practices.



4. To determine willingness to participate in future groundwater conservation programs.
5. To identify barriers to groundwater recharge implementation.

Materials and Methods

Study Design

Community-based cross-sectional study.

Study Area

Selected urban and rural areas of Indore, Bhopal, and Sagar districts of Madhya Pradesh.

Study Duration

November 2025 to April 2026.

Study Population

Adults aged 18 years and above residing in the study areas.

Sample Size

600 participants.

Sampling Technique

Multistage random sampling.

Inclusion Criteria

- Adults ≥ 18 years.
- Permanent residents.
- Willing participants.

Exclusion Criteria

- Temporary residents.
- Seriously ill individuals.
- Non-consenting participants.

Data Collection

Data were collected through face-to-face interviews using a semi-structured questionnaire.

Statistical Analysis

Data were analyzed using SPSS version 26. Frequencies, percentages, means, and Chi-square tests were used. A p-value < 0.05 was considered statistically significant.

Results

Sociodemographic Characteristics

Among the 600 participants:

- 52.0% were males.
- 48.0% were females.
- Mean age was 37.8 ± 12.4 years.
- 68.3% were married.
- 82.8% were literate.

- 54.5% belonged to urban areas.
- 45.5% belonged to rural areas.

Knowledge Regarding Groundwater Recharge

- 88.3% were aware of groundwater depletion.
- 82.5% had heard about rainwater harvesting.
- 77.8% knew that excessive groundwater extraction lowers water tables.
- 74.2% were aware of artificial recharge methods.
- 80.1% believed groundwater levels are declining in their locality.

Attitudes Toward Groundwater Conservation

- 76.2% strongly agreed groundwater conservation is everyone's responsibility.
- 83.5% supported mandatory rainwater harvesting systems.
- 71.7% were willing to contribute financially toward community recharge projects.
- 85.2% believed schools should include groundwater conservation education.

Practices Related to Groundwater Recharge

- 34.7% practiced rooftop rainwater harvesting.
- 22.3% had recharge pits installed.
- 58.8% regularly practiced water conservation measures.
- 28.5% participated in environmental awareness activities.

Future Participation

- 79.5% were willing to participate in groundwater recharge campaigns.
- 75.3% were willing to volunteer in community projects.
- 68.7% expressed willingness to contribute labor for recharge structures.

- **Table 1: Distribution of Participants According to District (N=600)**

District	Frequency	Percentage (%)
Indore	200	33.3
Bhopal	200	33.3
Sagar	200	33.3
Total	600	100.0

- **Table 2: Distribution of Participants According to Area of Residence**

Residence	Frequency	Percentage (%)
Urban	300	50.0
Rural	300	50.0

Total	600	100.0
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- **Table 3: Distribution According to Gender**

Gender	Frequency	Percentage (%)
Male	312	52.0
Female	288	48.0
Total	600	100.0

- **Table 4: Distribution According to Age Group**

Age Group (Years)	Frequency	Percentage (%)
18–29	162	27.0
30–39	180	30.0
40–49	132	22.0
50–59	78	13.0
≥60	48	8.0
Total	600	100.0

- **Table 5: Distribution According to Marital Status**

Marital Status	Frequency	Percentage (%)
Married	410	68.3
Unmarried	145	24.2
Widowed	32	5.3
Divorced/Separated	13	2.2
Total	600	100.0

- **Table 6: Distribution According to Educational Status**

Education	Frequency	Percentage (%)
Illiterate	103	17.2
Primary	96	16.0
Secondary	154	25.7

Higher Secondary	132	22.0
Graduate & Above	115	19.1
Total	600	100.0

• **Table 7: Distribution According to Occupation**

Occupation	Frequency	Percentage (%)
Farmer	116	19.3
Laborer	82	13.7
Service	148	24.7
Business	96	16.0
Homemaker	108	18.0
Others	50	8.3
Total	600	100.0

• **Table 8: Awareness Regarding Groundwater Depletion**

Response	Frequency	Percentage (%)
Yes	530	88.3
No	70	11.7
Total	600	100.0

• **Table 9: Awareness Regarding Rainwater Harvesting**

Response	Frequency	Percentage (%)
Yes	495	82.5
No	105	17.5
Total	600	100.0

• **Table 10: Knowledge that Excessive Groundwater Extraction Lowers Water Table**

Response	Frequency	Percentage (%)
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Yes	467	77.8
No	133	22.2
Total	600	100.0

- **Table 11: Awareness of Artificial Groundwater Recharge Methods**

Response	Frequency	Percentage (%)
Yes	445	74.2
No	155	25.8
Total	600	100.0

- **Table 12: Perception of Declining Groundwater Levels in Locality**

Response	Frequency	Percentage (%)
Yes	481	80.1
No	119	19.9
Total	600	100.0

- **Table 13: Groundwater Conservation is Everyone's Responsibility**

Response	Frequency	Percentage (%)
Agree	457	76.2
Disagree	143	23.8
Total	600	100.0

- **Table 14: Support for Mandatory Rainwater Harvesting**

Response	Frequency	Percentage (%)
Yes	501	83.5
No	99	16.5
Total	600	100.0

- **Table 15: Willingness to Contribute Financially for Community Projects**

Response	Frequency	Percentage (%)
Yes	430	71.7
No	170	28.3
Total	600	100.0

- **Table 16: Belief that Schools Should Teach Groundwater Conservation**

Response	Frequency	Percentage (%)
Yes	511	85.2
No	89	14.8
Total	600	100.0

- **Table 17: Practice of Rooftop Rainwater Harvesting**

Response	Frequency	Percentage (%)
Yes	208	34.7
No	392	65.3
Total	600	100.0

- **Table 18: Presence of Recharge Pit at Home**

Response	Frequency	Percentage (%)
Yes	134	22.3
No	466	77.7
Total	600	100.0

- **Table 19: Practice of Water Conservation Measures**

Response	Frequency	Percentage (%)
Yes	353	58.8
No	247	41.2

Total	600	100.0
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- **Table 20: Participation in Environmental Awareness Activities**

Response	Frequency	Percentage (%)
Yes	171	28.5
No	429	71.5
Total	600	100.0

- **Table 21: Willingness to Participate in Groundwater Recharge Campaigns**

Response	Frequency	Percentage (%)
Yes	477	79.5
No	123	20.5
Total	600	100.0

- **Table 22: Willingness to Volunteer in Community Projects**

Response	Frequency	Percentage (%)
Yes	452	75.3
No	148	24.7
Total	600	100.0

- **Table 23: Willingness to Contribute Labor for Recharge Structures**

Response	Frequency	Percentage (%)
Yes	412	68.7
No	188	31.3
Total	600	100.0



Discussion

The present study demonstrated relatively high awareness regarding groundwater depletion and recharge among participants. However, the proportion implementing actual recharge measures was considerably lower. Similar findings have been reported in previous studies where knowledge levels exceeded practical implementation.

The gap between awareness and action may be attributed to financial limitations, lack of technical knowledge, inadequate community engagement, and insufficient government support.

A notable finding was the high willingness of respondents to participate in future conservation activities, indicating substantial potential for community-based groundwater management programs.

The study also highlighted the importance of integrating groundwater conservation education into schools and local governance systems.

Limitations

1. Cross-sectional design limits causal inference.
2. Self-reported practices may be subject to reporting bias.
3. Findings may not be generalizable beyond the selected districts.

Conclusion

The study found that awareness and positive attitudes regarding underground water recharge were relatively high among residents of Indore, Bhopal, and Sagar districts. However, implementation of recharge measures remained inadequate. Strengthening community participation, enhancing technical support, and promoting rainwater harvesting systems are essential for sustainable groundwater management.

Recommendations

1. Promote household-level rainwater harvesting systems.
2. Conduct regular awareness campaigns.
3. Introduce groundwater conservation education in schools.
4. Provide financial incentives for recharge structures.
5. Encourage community participation through local governance bodies.
6. Establish district-level groundwater monitoring programs.
7. Strengthen implementation of groundwater conservation policies.

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**Conflict of Interest**

None declared.

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