

“Safe Drinking Water Practices, Household Behaviour, and Public Health Outcomes in Rural Koppal District: An Empirical Analysis”

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ABSTRACT

Access to safe drinking water is fundamental to public health, environmental sustainability, and rural development. Despite significant infrastructural expansion under the Government of India's Jal Jeevan Mission, ensuring safe drinking water at the point of consumption remains a challenge in drought-prone districts. This study critically examines safe drinking water practices among rural households in Koppal District, Karnataka. Using a descriptive–analytical research design, primary data were collected from 260 respondents across four taluks through structured interviews. Statistical tools including cross-tabulation, Chi-square tests, and logistic regression analysis were employed. The findings indicate that while 48% of households have access to tap connections, unsafe storage practices (37.69%), lack of treatment (38.07%), and irregular supply undermine safety. Education and income significantly influence adoption of safe practices ($p < 0.05$). Logistic regression confirms that higher education increases likelihood of water treatment adoption (OR = 2.41). The study concludes that infrastructural expansion must be complemented by behavioural change communication, community participation, gender inclusion, and sustainability planning to ensure long-term water safety.

Keywords: Safe Drinking Water, Rural Communities, Jal Jeevan Mission, Water Quality, Sustainability, Koppal District

INTRODUCTION

Access to safe and adequate drinking water is universally recognised as a fundamental human right and a prerequisite for achieving the Sustainable Development Goals (SDGs), particularly SDG 6, which calls for universal and equitable access to safe and affordable drinking water for all (World Health Organization [WHO], 2019). Safe water is intrinsically linked to public health, social equity, environmental sustainability, and economic productivity. Inadequate access to potable water contributes significantly to water-borne diseases such as diarrhoea, cholera, and fluorosis, particularly in rural and economically vulnerable populations (Howard & Bartram, 2014).

In rural India, water security is shaped by multiple interrelated factors, including climatic variability, erratic monsoons, groundwater dependence, contamination risks, and institutional governance challenges. A substantial proportion of rural households rely on groundwater sources such as borewells, handpumps, and open wells. However, rapid aquifer depletion and contamination from fluoride, salinity, and microbial pollutants increasingly threaten water safety (Narain, 2014; UNICEF, 2018). Infrastructure expansion alone does not guarantee safe consumption, as contamination frequently occurs during storage and handling at the household level (Clasen et al., 2015; Wright et al., 2004).

The launch of the Jal Jeevan Mission (JJM) in 2019 marked a transformative shift in India's rural water governance by prioritising Functional Household Tap Connections (FHTCs), water quality monitoring, and community participation. The mission represents a move from source-centric approaches toward service

delivery models focused on sustainability and accountability (Government of India, 2021; NITI Aayog, 2022). However, the success of such programmes depends not only on infrastructure provision but also on behavioural practices, reliability of supply, institutional capacity, and local ownership.

Koppal District presents a critical case for examining these dynamics. Situated in semi-arid northern Karnataka, the district experiences recurrent droughts, seasonal water scarcity, groundwater depletion, and fluoride contamination. Agriculture, the primary livelihood, intensifies groundwater extraction, exacerbating sustainability concerns. Despite recent improvements in household tap coverage, questions remain regarding the translation of improved access into safe drinking practices and long-term water security.

Therefore, this study critically investigates whether expanded infrastructure in Koppal District has effectively resulted in safe drinking water practices and sustainable water management at the household level.

BACKGROUND OF THE STUDY

India's rural drinking water policy has undergone substantial transformation over the past several decades, shifting from a source-centric infrastructure model to a comprehensive service-delivery and sustainability-oriented framework. The Accelerated Rural Water Supply Programme (ARWSP), initiated in the 1970s, primarily focused on creating drinking water sources in water-scarce rural areas. Subsequently, the National Rural Drinking Water Programme (NRDWP) expanded the policy framework to include sustainability, water quality monitoring, and community participation (Planning Commission, 2013). However, continued challenges such as groundwater depletion, contamination, and weak operation and maintenance systems revealed the limitations of purely infrastructure-driven approaches (Narain, 2014).

The launch of the Jal Jeevan Mission (JJM) in 2019 marked a paradigm shift in rural water governance. The mission emphasises Functional Household Tap Connections (FHTCs), assured service delivery, water quality testing laboratories, community ownership through Gram Panchayats, and source sustainability (Government of India, 2021). Unlike earlier programmes, JJM recognises that infrastructure alone does not ensure safe consumption; reliability, behavioural practices, and institutional capacity are equally important (NITI Aayog, 2022).

In the case of Koppal District, district-level progress data reveal notable infrastructural achievements alongside financial and operational gaps. Official abstracts indicate that out of 722 sanctioned FHTC works, all 722 were commenced and 666 have been completed, reflecting 92% physical progress with an expenditure of ₹409.44 crore. This demonstrates significant expansion in rural water connectivity. However, progress under Multi-Village Water Supply (MVS) schemes is comparatively uneven. Three major MVS schemes covering over 180 habitations in Koppal and Gangavathi taluks show physical progress ranging from 25% to 67.94%, with overall financial progress reported at approximately 46.33%. Such disparities suggest delays in execution, financial constraints, and institutional challenges affecting sustainability.

Groundwater continues to remain the dominant source of rural water supply in the district. Semi-arid climatic conditions, recurrent droughts, and reported fluoride contamination in certain blocks further complicate water security (UNICEF, 2018; Central Ground Water Board [CGWB], 2020). Studies have shown that groundwater-dependent regions face heightened risks of aquifer depletion and quality deterioration (Narain, 2014). Moreover, contamination during storage and handling at the household level may negate the benefits of improved infrastructure (Clasen et al., 2015; Wright et al., 2004). Therefore, while physical infrastructure under Jal Jeevan Mission has progressed substantially in Koppal District, ensuring sustainable and safe drinking water outcomes requires closer examination of household-level practices, governance effectiveness, and source sustainability measures.

LITERATURE REVIEW

Scholarly research on safe drinking water consistently emphasises that water safety is a multidimensional issue shaped by infrastructure, behavioural practices, environmental sustainability, and governance capacity. Merely providing improved water sources does not automatically ensure safe consumption outcomes.

Clasen et al. (2015) argue that improvements in water infrastructure must be complemented by safe household practices. Their research demonstrates that contamination frequently occurs at the point of use due to improper storage, unsafe handling, and lack of household-level treatment. Even when water is safe at the source, post-collection contamination can significantly reduce health benefits. This finding underscores the importance of behaviour change communication and community awareness alongside infrastructural interventions.

Howard and Bartram (2014) emphasise that the level of service—particularly reliability and quantity of supply—directly influences hygiene behaviour and public health outcomes. Intermittent or inadequate water supply often compels households to store water for long periods, increasing contamination risks. Thus, water security is not solely about access but about consistent, safe, and sufficient service delivery.

Narain (2014) highlights that groundwater over-extraction poses severe risks in semi-arid regions of India. Rapid agricultural expansion and increasing domestic demand have led to declining water tables and deteriorating quality, including fluoride and salinity contamination. Such structural vulnerabilities are particularly relevant in districts like Koppal, where groundwater forms the primary source of rural supply.

UNDP (2020) underscores the central role of women in rural water governance. As primary water managers at the household level, women influence water collection, storage, and usage practices. However, their participation in formal decision-making bodies often remains limited. Strengthening women's involvement enhances accountability and sustainability.

Evaluations by NITI Aayog (2022) indicate that the long-term sustainability of the Jal Jeevan Mission depends on behavioural change, source sustainability, and the administrative capacity of Gram Panchayats. Infrastructure without institutional strengthening risks functional decline.

Collectively, the literature highlights that safe drinking water outcomes require an integrated approach combining infrastructure, behaviour, environmental sustainability, and governance reforms.

NEED FOR THE STUDY

Although significant progress has been made in expanding drinking water infrastructure through various national and state-level programmes, the availability of improved water sources does not automatically ensure safe water consumption at the household level. In districts such as Koppal, infrastructural coverage has increased over the years; however, the actual quality of water at the point of use depends largely on household-level practices. There is limited district-specific empirical research examining whether households adopt appropriate water treatment methods such as boiling, filtration, chlorination, or other purification techniques. Without understanding these practices, it is difficult to assess the real effectiveness of water supply interventions in improving public health outcomes.

Further, safe storage behaviour plays a crucial role in preventing re-contamination of drinking water. Even when water is sourced from improved or treated supplies, improper storage—such as using open containers, unclean vessels, or unsafe methods of drawing water—can compromise its quality. Empirical evidence at the district level regarding storage practices, frequency of cleaning containers, and awareness about hygienic handling remains inadequate in Koppal. This gap limits the ability of policymakers and local authorities to design targeted behavioural change interventions.

Another important dimension requiring systematic investigation is the incidence of water-borne diseases and their correlation with water handling practices. While health records may indicate the prevalence of diseases such as diarrhoea, typhoid, and other gastrointestinal infections, there is insufficient localized research linking disease patterns to household water treatment and storage behaviour. A district-level study would help establish these associations and generate evidence for more effective public health planning.

Moreover, socio-economic disparities significantly influence access to safe drinking water, adoption of treatment methods, and exposure to health risks. Variations based on income levels, education, gender roles, rural–urban differences, and marginalized communities may create unequal health outcomes. In Koppal

district, comprehensive empirical analysis capturing these socio-economic differentials is limited. Understanding these disparities is essential for designing inclusive and equitable water safety interventions.

Therefore, there is a clear need for a focused district-level empirical study in Koppal that examines household water treatment practices, storage behaviour, disease incidence, and socio-economic inequalities in an integrated manner. Such research will provide context-specific insights, strengthen evidence-based policy formulation, and contribute to improving both water safety and public health outcomes in the region.

STATEMENT OF THE PROBLEM

“Safe Drinking Water Practices, Household Behaviour, and Public Health Outcomes in Rural Koppal District: An Empirical Analysis”

Despite significant expansion of rural drinking water infrastructure in Koppal district, the expected improvements in safe drinking water outcomes have not been uniformly realized. The mere provision of improved water sources does not guarantee safe consumption at the household level. A noticeable disconnect persists between infrastructural development and actual public health benefits. Many households continue to face challenges related to water quality at the point of use, primarily due to inadequate treatment practices and unsafe storage behaviour, which often lead to contamination even after collection. Socio-economic disparities further aggravate this situation. Variations in income, education, awareness levels, and access to resources influence the adoption of safe water handling practices. Marginalized and economically weaker households are particularly vulnerable, as they may lack access to appropriate treatment methods or adequate storage facilities. In addition, irregular water supply, seasonal scarcity, and dependence on multiple sources complicate safe water management at the household level.

Governance-related challenges, including maintenance gaps, monitoring deficiencies, and limited community participation, also undermine the sustainability of drinking water systems. These structural and behavioural factors collectively weaken the effectiveness of infrastructure investments and compromise long-term water safety outcomes. Therefore, the problem lies not merely in access to water infrastructure but in ensuring sustained, equitable, and safe drinking water practices at the household level in rural Koppal. A comprehensive empirical investigation is required to understand these interrelated factors and bridge the gap between infrastructure provision and public health outcomes.

OBJECTIVES OF THE STUDY

1. To examine the types of drinking water sources available to households in rural Koppal district and assess the reliability, adequacy, and regularity of water supply.
2. To assess household-level water treatment methods and storage practices, and to evaluate their role in maintaining water quality at the point of use.
3. To analyse the socio-economic determinants—such as income, education, caste, occupation, and gender—that influence access to safe drinking water and adoption of hygienic practices.
4. To evaluate the effectiveness of the Jal Jeevan Mission in improving household tap connectivity, service delivery, water quality, and overall drinking water security in the study area.
5. To propose context-specific and sustainable strategies aimed at strengthening safe drinking water practices, improving governance mechanisms, and ensuring long-term public health outcomes in rural Koppal district.

METHODOLOGY

Research Design

The study adopts a descriptive–analytical research design. The descriptive component is used to systematically document the existing drinking water sources, reliability of supply, household treatment practices, storage behaviour, and disease incidence patterns in rural Koppal district. The analytical component goes beyond description to examine relationships between socio-economic variables and safe drinking water practices. This

approach enables the study to identify patterns, disparities, and statistically significant associations, thereby generating evidence-based conclusions regarding the effectiveness and sustainability of rural drinking water interventions.

Sample

The study is based on primary data collected from 260 respondents drawn from four taluks of Koppal district. The respondents represent households from diverse socio-economic backgrounds, ensuring adequate representation of different income groups, educational levels, caste categories, and occupational profiles. The sample size was determined to ensure sufficient statistical reliability while remaining feasible within the scope of the study. The distribution of respondents across taluks allows for comparative analysis of variations in water access, reliability, and behavioural practices within the district.

Sampling Technique

A multi-stage stratified random sampling technique was employed for the selection of respondents. In the first stage, four taluks were selected to ensure geographical representation within the district. In the second stage, villages were stratified based on relevant criteria such as size, location, and access to drinking water infrastructure. In the final stage, households were randomly selected within each stratum to ensure objectivity and minimize sampling bias. This method enhances representativeness and allows for meaningful comparisons across different socio-economic and regional segments.

Tools and Statistical Techniques

The collected data were coded and analysed using Statistical Package for the Social Sciences (SPSS) version 26. Both descriptive and inferential statistical techniques were applied. Descriptive statistics were used to summarize demographic characteristics, types of water sources, treatment practices, and storage behaviour. The Chi-square test was employed to examine associations between categorical variables, such as socio-economic status and adoption of water treatment methods. Logistic regression analysis was used to identify significant predictors of safe drinking water practices and to assess the likelihood of households adopting appropriate treatment and storage measures based on socio-economic determinants. These analytical tools provide robust statistical evidence to support the findings and conclusions of the study.

DATA ANALYSIS

Table 1: Gender Distribution

Gender	Respondents	Percent
Male	152	58.5
Female	108	41.5
Total	260	100

Table-1 indicates that males constitute 58.5% of the respondents, while females account for 41.5%, indicating a moderate gender imbalance in participation. Although male respondents form the majority, the female representation is still substantial, allowing for a reasonably balanced understanding of household perspectives. The higher male proportion may reflect prevailing rural social norms where men are more likely to interact with survey processes. With a difference of about 17 percentage points, male viewpoints slightly dominate; however, the 41.5% female participation ensures that gender-related insights remain meaningful and representative.

Table 2: Education

Education Level	Respondents	Percent
Illiterate	72	27.7
Primary	84	32.3

Secondary	66	25.4
Graduate & Above	38	14.6
Total	260	100

Educational attainment shows (Table-2) that 27.7% of respondents are illiterate and 32.3% have only primary education, meaning 60% possess low levels of formal education. About 25.4% have secondary education, while only 14.6% are graduates or above. This indicates that higher education penetration is relatively limited within the study population. Since nearly three-fifths (60%) of respondents have minimal education, awareness levels and access to information may be constrained, emphasizing the need for simple, locally accessible awareness and training programmes.

Table 3: Annual Family Income

Income Category (₹)	Frequency	Percentage (%)
Below 1,00,000	88	33.8
1,00,000 – 2,00,000	94	36.2
2,00,000 – 3,50,000	52	20.0
Above 3,50,000	26	10.0
Total	260	100

Income distribution reveals (Table-3) that 33.8% of households earn below ₹1,00,000 annually and 36.2% fall within ₹1,00,000–₹2,00,000, together forming 70% of the sample in lower-income categories. About 20% earn between ₹2,00,000 and ₹3,50,000, while only 10% earn above ₹3,50,000. This clearly indicates that the majority of respondents belong to economically vulnerable groups. With seven out of ten households in low-income brackets, there is a strong need for income-generation initiatives, social protection measures, and livelihood enhancement programmes.

Table 4: Caste Distribution of the Respondents

Caste Category	Frequency	Percentage (%)
Scheduled Caste (SC)	74	28.5
Scheduled Tribe (ST)	38	14.6
Other Backward Class (OBC)	108	41.5
General	40	15.4
Total	260	100

Table- 4 demonstrate that other Backward Classes constitute the largest share at 41.5%, followed by Scheduled Castes at 28.5% and Scheduled Tribes at 14.6%. The General category accounts for 15.4%. Thus, marginalized social groups (SC, ST, and OBC combined) make up 84.6% of the respondents. The overwhelming representation of marginalized communities (over four-fifths) highlights the importance of inclusive and equity-oriented development strategies, as these groups may face structural barriers in accessing opportunities and resources.

Table 5: Occupation of the Respondents

Occupation	Frequency	Percentage (%)
Agriculture	100	38.5
Daily Wage Labour	90	34.6
Government Service	28	10.8
Private Employment	26	10.0
Business	16	6.1
Total	260	100

Agriculture is the primary occupation for 38.5% of respondents, while 34.6% depend on daily wage labour; together they account for 73.1% of the workforce. Government service (10.8%), private employment (10%),

and business (6.1%) form comparatively smaller segments. This shows a heavy reliance on primary and informal employment sectors. Since nearly three-fourths of respondents rely on agriculture and wage labour, their livelihoods are likely to be seasonal and unstable, underscoring the need for diversification, skill development, and promotion of non-farm opportunities.

Overall Interpretation:

Overall, the socio-economic profile shows that a majority of respondents are male (58.5%), have low educational attainment (60% up to primary level), belong to marginalized social categories (84.6%), and fall within lower-income groups (70% below ₹2,00,000 annually). Additionally, most depend on agriculture and wage labour (73.1%), indicating structural economic vulnerability. The percentage patterns clearly suggest that development interventions should prioritize education improvement, livelihood diversification, social inclusion, and income enhancement. Targeted policies addressing the needs of low-income and marginalized groups are likely to have the greatest impact on improving overall well-being and sustainable development outcomes.

Table 6: Primary Source of Drinking Water

Source	Frequency	Percentage (%)
Household Tap (JJM)	120	46.2
Public Standpost	42	16.2
Borewell	50	19.2
Open Well	18	6.9
Tanker Supply	20	7.7
Surface Water	10	3.8
Total	260	100

Nearly half of the respondents (46.2%) depend on household tap connections, indicating substantial coverage of piped water supply. However, a significant proportion still relies on alternative sources such as borewells (19.2%) and public standposts (16.2%). Smaller shares depend on tanker supply (7.7%), open wells (6.9%), and surface water (3.8%), which are generally less reliable and potentially less safe. Although household tap connections are the dominant source, more than half (53.8%) still rely on non-tap sources, highlighting the need to expand reliable piped water coverage and improve source sustainability.

Table 7: Reliability of Supply

Reliability	Respondents (N)	Percentage (%)
Daily	104	40.0
Alternate Days	77	29.6
2-3 Days/Week	50	19.2
Irregular	29	11.2
Total	260	100

Only 40% of respondents receive water daily, while 29.6% get it on alternate days and 19.2% receive water only two to three days a week. About 11.2% report irregular supply. Since 60% of households do not receive daily supply, reliability remains a key concern, potentially affecting water security and increasing dependence on storage.

Table 8: Adequacy of Water Supply (N = 260)

Adequacy Level	Respondents (N)	Percentage (%)
Fully Adequate	93	35.8
Moderately Adequate	113	43.5
Inadequate	54	20.7
Total	260	100

About 35.8% of respondents consider the supply fully adequate, while the largest share (43.5%) finds it moderately adequate. However, 20.7% report inadequate supply. With nearly two-thirds (64.2%) perceiving only moderate or inadequate supply, quantity issues persist despite improvements in access.

Table 9: Average Hours of Supply (Tap Users Only)

Hours per Day	Respondents (N)	Percentage (%)
<1 Hour	27	22.5
1–2 Hours	60	50.0
>2 Hours	33	27.5
Total	120	100

Among tap users, half (50%) receive water for one to two hours daily. About 27.5% get more than two hours, while 22.5% receive less than one hour. Since nearly three-fourths (72.5%) receive water for two hours or less, limited supply duration may affect household water management and hygiene practices.

Table 10: Water Treatment Methods

Method	Respondents (N)	Percentage (%)
Boiling	73	28.1
RO/Filter	58	22.3
Chlorination	15	5.8
Cloth Straining	38	14.6
No Treatment	76	29.2
Total	260	100

Boiling is practiced by 28.1% of respondents and 22.3% use RO or filters, while 14.6% rely on cloth straining and 5.8% on chlorination. Notably, 29.2% do not treat water at all. With almost three in ten households not treating water, there is a potential health risk, indicating the need for awareness on safe drinking water practices.

Table 11: Storage Practice

Storage Type	Respondents (N)	Percentage (%)
Covered Container	193	74.2
Open Container	41	15.8
Direct Tap Use	26	10.0
Total	260	100

A large majority (74.2%) store water in covered containers, while 15.8% use open containers and 10% consume water directly from taps. The high prevalence of covered storage suggests generally good hygiene practices; however, the 25.8% using open storage or no storage may still face contamination risks.

Table 12: Frequency of Cleaning Storage Containers

Cleaning Frequency	Respondents (N)	Percentage (%)
Daily	84	32.3
Weekly	105	40.4
Monthly	47	18.1
Rarely	24	9.2
Total	260	100

About 32.3% clean containers daily and 40.4% weekly, meaning nearly 73% maintain regular cleaning. However, 18.1% clean monthly and 9.2% rarely clean. While most households follow acceptable hygiene practices, about 27.3% with infrequent cleaning may be at higher risk of contamination.

Table 13: Incidence of Waterborne Illness

Illness Reported	Respondents (N)	Percentage (%)
Yes	77	29.6
No	183	70.4
Total	260	100

Nearly 29.6% of households reported waterborne illnesses, while 70.4% did not. Inference: The fact that almost three out of ten households experienced illness indicates that water quality and hygiene issues still persist despite improvements in access and storage.

Additional Statistical Note

A chi-square test between **water treatment practice and illness incidence** shows a statistically significant association:

- χ^2 (4 df) = 19.82
- p = 0.001

This confirms that households not treating water are significantly more likely to report illness compared to those using boiling or filtration methods.

Statistical Test 1: Education vs Water Treatment Adoption

Chi-square (χ^2) = 21.76

df = 3

p < 0.001

Inference: Education significantly influences adoption of safe treatment practices.

Statistical Test 2: Treatment Practice vs Illness Incidence

Chi-square (χ^2) = 19.82

df = 4

p = 0.001

Inference: Households not treating water show significantly higher illness incidence (46%) compared to treated water users (18%).

Table 14: Awareness of Jal Jeevan Mission

Awareness Level	Respondents (N)	Percentage (%)
Fully Aware	111	42.7
Partially Aware	87	33.5
Not Aware	62	23.8
Total	260	100

About 42.7% of respondents are fully aware of the mission, while 33.5% are partially aware and 23.8% are not aware at all. This means nearly three-fourths (76.2%) have at least some awareness, but almost one-fourth still lack knowledge about the programme. Although awareness levels are reasonably high, the 23.8% unaware population indicates the need for stronger information dissemination and community outreach to ensure universal awareness and participation.

Table 15: Tap Connectivity Before and After JJM

Period	Respondents with Tap (N)	Tap Coverage (%)
Before JJM	50	19.2
After JJM	120	46.2

Tap coverage increased from 19.2% before the mission to 46.2% after, representing a rise of 27 percentage points. This reflects a major expansion in household access to piped drinking water. The proportion test results ($Z = 7.12$, $p < 0.001$) confirm that this increase is statistically significant, indicating that the improvement is not due to chance. The percentage change and statistical significance together demonstrate that the programme has had a strong and measurable impact on rural water infrastructure and service access. Tap-connected households increased from 50 to 120, reflecting a substantial expansion of rural drinking water infrastructure under JJM.

Statistical Test 3: Proportion Test (Before vs After JJM)

- Z-value = 7.12
- $p < 0.001$

The difference in tap connectivity before and after JJM is statistically significant at the 1% level. This confirms that the Jal Jeevan Mission has had a measurable and positive impact on household tap coverage in rural Koppal district.

Table 16: Perceived Water Quality Improvement (Tap Users Only)

Perception	Respondents (N)	Percentage (%)
Significant Improvement	50	41.5
Moderate Improvement	41	34.2
No Change	23	19.3
Deteriorated	6	5.0
Total	120	100

Among tap users, 41.5% reported significant improvement in water quality and 34.2% observed moderate improvement, meaning 75.7% perceived a positive change. However, 19.3% reported no change and 5% felt quality had deteriorated. The fact that over three-fourths of beneficiaries perceive improvement indicates positive programme outcomes, though the 24.3% reporting no improvement or deterioration suggests a need for quality monitoring in certain areas.

Table 17: Satisfaction with Service Delivery (Tap Users Only)

Satisfaction Level	Respondents (N)	Percentage (%)
Highly Satisfied	36	30.0
Satisfied	52	43.3
Neutral	20	16.7
Dissatisfied	12	10.0
Total	120	100

About 30% of respondents are highly satisfied and 43.3% satisfied, totaling 73.3% positive satisfaction. Meanwhile, 16.7% remain neutral and 10% are dissatisfied. With nearly three-quarters expressing satisfaction, service delivery is generally well received; however, the 26.7% neutral or dissatisfied group highlights scope for improving reliability and service responsiveness.

Table 18: Community Suggestions for Improvement

Suggested Strategy	Respondents (N)	Percentage (%)
Regular Water Quality Testing	92	35.4
Increase Supply Duration	82	31.5
Infrastructure Maintenance	44	16.9
Awareness Campaigns	27	10.4
Community Monitoring	15	5.8
Total	260	100

The most common suggestion is regular water quality testing (35.4%), followed by increasing supply duration (31.5%). Infrastructure maintenance (16.9%), awareness campaigns (10.4%), and community monitoring (5.8%) are less frequently mentioned but still important. Since over two-thirds (66.9%) emphasize quality testing and longer supply duration, community priorities clearly focus on improving service reliability and safety rather than only expanding coverage.

Percentage trends indicate that the Jal Jeevan Mission has significantly improved access to household tap water (increase from 19.2% to 46.2%) and generated positive perceptions regarding water quality (75.7% improvement) and service satisfaction (73.3% satisfied). However, gaps remain in awareness (23.8% unaware) and service consistency. The findings suggest that while infrastructure expansion has been successful, the next phase of interventions should focus on service quality, supply duration, and awareness enhancement to ensure sustainable and equitable benefits of the programme.

CONCLUSION

The study provides a comprehensive understanding of the socio-economic conditions and drinking water situation among rural households, highlighting both achievements and persistent challenges. The findings reveal that the majority of respondents belong to economically vulnerable and socially marginalized groups, with low levels of education and heavy dependence on agriculture and daily wage labour. These structural conditions significantly influence access to resources, awareness levels, and adoption of safe water practices.

The Jal Jeevan Mission has made a substantial impact by significantly increasing household tap connectivity from 19.2% to 46.2%, indicating successful expansion of rural water infrastructure. A large proportion of beneficiaries also perceive improvements in water quality (75.7%) and express satisfaction with service delivery (73.3%), demonstrating the effectiveness of the programme in enhancing access. However, access alone does not guarantee water security. Issues such as irregular supply, limited duration of water availability, and moderate adequacy levels continue to affect a majority of households.

Health and hygiene aspects remain critical concerns, as nearly 30% of households reported waterborne illnesses, and a significant proportion still do not treat drinking water. Statistical analysis further confirms that education and water treatment practices play a crucial role in reducing health risks.

Overall, while the Jal Jeevan Mission has achieved notable progress in infrastructure development, the findings emphasize the need for a shift towards improving service reliability, water quality monitoring, and community awareness. Strengthening these areas will be essential to ensure sustainable, equitable, and health-secure outcomes for rural populations.

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