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Sameena
 Student of MA Geography,
 Department of Geography,
 Panjab University,
 Chandigarh, India

Drinking water in Haryana: A geographical analysis of Village Singhpura, Jind

Sameena

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Abstract

In the village of Singhpura, most households get their drinking water from borewells (58%), while 38% use tap water and 4% rely on hand pumps. Although community water is available through pipes, only 38% of households use it for drinking due to issues like low water pressure or absence of pipes in some areas.

While 82% of households find the drinking water fresh and odourless, about 8% notice a metallic taste, and 6% detect a strong chlorine taste. Additionally, 4% report foul Odors and unusual tastes. Health issues related to drinking water affect 11% of households using community water. Groundwater quality is a major concern due to high Total Dissolved Solids (TDS) levels, ranging from 68 to 1357 PPM, which affect taste and safety which is so harmful. Most households use Reverse Osmosis (RO) systems to improve water quality. The highest TDS levels are found in the village centre, posing health risks, while outer areas have slightly better quality. Effective monitoring and intervention are crucial to ensure safe drinking water for all residents.

Regarding water treatment, 62% of households use water directly without treatment, 28% use water filters, and 10% use chlorine tablets. Cleaning practices vary, with 66% of households cleaning water storage containers daily, 6% weekly, 22% monthly, and 8% rarely or never. To enhance water quality and public health in Singhpura, it is crucial to address pipe-related issues, ensure effective water treatment, and promote regular cleaning of water storage containers.

Keywords: Water sources, Haryana, Singhpura, Jind, quality of drinking water, TDS, reverse osmosis, treatment etc.

Introduction

Clean and safe drinking water is essential for human health and helps reduce the burden of common illnesses, such as diarrheal disease, especially in young children. However, in 2010, it was estimated that 1.8 billion people worldwide drank unsafe water. This problem is most common in developing countries and is worse in rural areas. In these communities, people often store water collected from rivers, springs, community stand-pipes, and boreholes in containers like jerry cans, buckets, drums, basins, and local pots. Even in homes with piped water, storage is still necessary because the supply is not continuous.

South Africa is a semi-arid country with limited water resources, making the provision of adequate water-supply systems a significant challenge. In some major cities, access to clean and safe drinking water is comparable to developed cities, but many towns and villages face erratic or non-existent water supplies. Similarly, in India, hand pumps and tube wells are the most common sources of drinking water, especially in rural areas, with only 36.6% of households receiving piped water. There is a stark difference between rural and urban areas in India. 61.4% of urban homes have piped water, compared to just 25% in rural areas.

Bottled water is popular in Indian cities, with about 9.8% of urban households using it as their main source of drinking water. Almost every household in India, about 96%, has access to an "improved source of drinking water", which includes piped water, public taps, tube wells, hand pumps, protected wells and springs, water from tankers, bottled water, and even rainwater. However, many rural households still lack access to water inside their homes, and fetching water is often a task disproportionately performed by women.

In recent years, more Indian states have improved access to tap water. For instance, Bihar saw an 86% increase in households with piped drinking water from 2019 to 2023. Despite these improvements, nearly half of the rural households without piped water in 2019 still don't have it.

Corresponding Author:
Sameena
 Student of MA Geography,
 Department of Geography,
 Panjab University,
 Chandigarh, India

In Haryana, every village had access to at least one safe drinking water source by 1992, and efforts have since focused on enhancing water supply infrastructure. Water is vital for all living beings and essential for various uses, including domestic, industrial, and agricultural purposes. The quality and availability of water significantly impact development, industries, and irrigation. In India, the chief sources of drinking water are hand pumps, taps, wells, and tube wells, with groundwater being the primary source for domestic needs. However, excessive groundwater withdrawal has led to a decrease in the water table, causing salinity and water quality problems.

Water quality monitoring is crucial for managing water resources effectively. In Haryana's Jind district, most rural residents use over 500 litres of water daily, and rainwater harvesting is minimal. The summer months bring water shortages, affecting both people and animals. The administration has implemented several programs to encourage water conservation, such as "Jal Gram Yojana" and "Har Ghar Jal Yojana".

Understanding the sources and quality of water is crucial for ensuring safe drinking water and effective water resource management, particularly in rural areas. This introduction provides a foundation for analysing drinking water quality and its management in rural Haryana, specifically focusing on village Singhpura in Jind district.

Study area

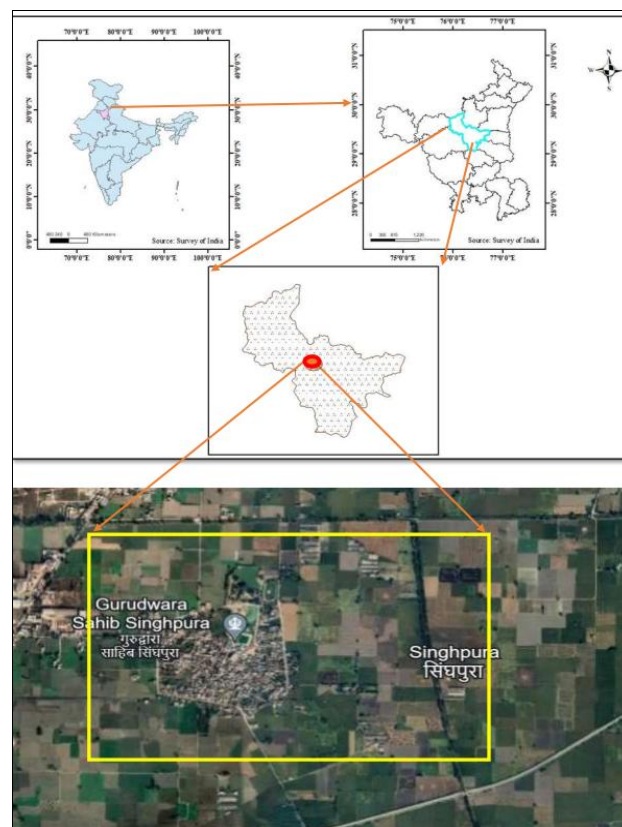
Haryana, positioned between 27°30' and 30°35' N latitude and 74°28' and 77°36' E longitude, is an integral part of the northwestern arid and semiarid plains. This state experiences an average rainfall of 545mm. Bounded by the Shivalik hills in the north, the Aravalli range in the southwest, the Yamuna River in the east, and the Ghaggar River acting as a western boundary, Haryana exhibits diverse geographical features. The state is characterized by four distinct regions, northern, eastern, western, and southern, each differing in relief, climate, soils and water characteristics. In the Haryana state presently total 22 districts, 73 sub-divisions, 93 tehsils, 50 sub-tehsils and 142 development blocks. It also has 154 cities/towns and 7,030 villages and 6234 villages panchayats. For administration purpose a multi-level administration has been set up at Haryana encompassing each and every unit.

As per details from Census 2011, Haryana has population of 2.54 Crores. Total population of Haryana as per latest census data is 25,351,462 of which male and female are 13,494,734 and 11,856,728 respectively. Sex Ratio in Haryana is 879 i.e. for each 1000 male, which is below national average of 940 as per latest census. In 2001, the sex ratio of female was 861 per 1000 males in Haryana; and the literacy rate in Haryana is 75.55 percent as per latest population census of that, male literacy stands at 84.06 percent while female literacy is at 65.94 percent. In the northern region, where the study area is situated, holds significance in this narrative. The study is situated in the Jind district of Haryana. Its total area is 2702sq km and 7 seven blocks; Safidon is the block where the Singhpura lies. The total geographical area of the study area spans 298 hectares. Physiographically, it constitutes a part of the Punjab, Haryana plain which is largely flat, featureless and monotonous alluvial upland plain and is formed of Pleistocene and sub-Recent alluvial deposits of the Indo-Gangetic system. It is dotted only sporadically with sand

dunes and depression, yielding a local relief of not more than 6m. The district does not offer much physiographic diversity. There is no perennial river in the district. Only a small river Chautang nadi enters the district near the village Mundh and debouches near village Bosini into Karnal district after covering about a distance of ten kilometers in Jind district.

Singhpura village, located in the Safidon tehsil of Jind district in Haryana, falls within the northern region. Positioned 2km away from the Safidon sub-district and 35km from the district headquarters, Singhpura is home to a population of 2,887 individuals. The male population stands at 1,503, while the female population is 1,384. The village boasts a literacy rate of 65.47%, with 74.12% of males and 56.07% of females being literate. There are about 554 houses in Singhpura village.

According to the 2019 statistics, Singhpura village falls under the Safidon assembly constituency and the Sonipat parliamentary constituency. Safidon serves as the nearest town for all major economic activities in this region. This detailed overview sets the context for a more in-depth exploration of the specific challenges and characteristics of Singhpura village within the broader geographical and socio-economic context of Haryana. In Singhpura rapid ground water extraction due to low management policies and no knowledge about water conservation in the residence.



Source: DCHB and Google Earth Pro, 2023.

Map 1: Location of study area

Review of literature

A huge amount of literature is available in the context of quality of water on the level of international, national, states level and also regional level. There is a large number of research papers published related to present condition of water table of groundwater. Some important studies are

listed following that form the base of our study and gave a direction to our present study.

Kaif & Firoz (2021) ^[17] in their study they focus mainly two district and said that the study looked at water quality in Karnal and Kurukshetra districts. They checked 9 things like pH, saltiness, and certain chemicals in 20 different places after the rainy season in 2019. Results showed that 60% of the area had polluted water, meaning it's not safe to drink without treating it first. About 80% of the samples had a problem called RSC, which makes the water quality poor. Some samples also had too much sodium, which is not good for health. Overall, they found that most of the water needs treatment before people can drink it safely. Singh, Kumar and Saharan (2011) ^[17], The study looked at groundwater in Jind district, Haryana, checking 71 samples from tube wells and hand pumps. Tests for pH, minerals, and contaminants were done, comparing with safety standards. In Safidon, 19 out of 36 samples were okay to drink, but 17 needed treatments, mainly for hardness. Julana's 35 samples all needed treatment for hardness. Sadly, nearly all groundwater in Safidon and Julana isn't safe to drink due to high hardness. Urgent actions are needed to make sure people have clean water in these areas. Singh (2017) ^[11] in his study find out that in Panghal village, tap water usage for drinking decreased significantly due to irregularity, poor quality, and lack of awareness about safety. Handpumps and tubewells became popular alternatives, especially among SC and OBC households, due to better accessibility and reliability. Fluctuating usage of different water sources indicates the village's unsustainable water situation. The government should prioritize improving piped water supply, addressing tap water issues, and enhancing canal water infrastructure to reduce scarcity and leakage. Regular monitoring of water quality and involving the community in water management are crucial steps. Installing height tanks or boosters can help alleviate electricity and low-pressure issues, ensuring reliable water supply. Khurana (2022) ^[8] in the study analysed that Ensuring clean drinking water for India's rural population of over 700 million is a huge challenge due to diverse factors like awareness levels, economic status, and pollution. Poor water quality leads to significant health issues, affecting millions annually and costing the country economically. Although access to safe drinking water has improved, challenges remain in ensuring consistent supply and quality. Government initiatives like the National Rural Drinking Water Quality Monitoring and Surveillance Programme aim to address these issues through community involvement and monitoring. However, coordination among different ministries and institutions is crucial for success. Communities must also play a key role in 10 maintaining water hygiene and storage practices. Overall, a holistic and community centred approach is essential for sustainable water management and ensuring this basic necessity for all.

Research objective

The present paper will work on following objectives:

- To explore the various drinking water sources used by household in the village.
- To examine the quality of drinking water sources in the village.

Research methodology

This study is purely based on the primary data and so for the fulfilment of the research objectives the data will be collected through primary field survey from the households. Total 10% of the households (of the total population of the village) will be selected for the final field survey through simple random sampling. After that will be processed through coding and tabulation. Then it will be analysed through systematically to achieve the objectives. And the results have be shown through pie charts, diagrams and map with the help of Arc Gis.

Results and Discussion

In Singhpura village, there are a total of 550 households. For the present study 10% of the house hold has been selected through random sampling. Then data has been collected through field survey with the help of questionnaire. Out of those surveyed, 64% were female, and 36% were male. When we looked at their ages, 14% fell into the 18-30-year group, 28% were in the 30-40-year group, another 28% were in the 40-50-year group, 12% were in the 50-60-year group, and 18% were above 60 years old.

In terms of education, 34% of those surveyed house hold were illiterate, 48% had some schooling, 10% were graduates, and 8% had post-graduate qualifications. Among the educated individuals, 8% worked in government jobs, 10% worked in the private sector, 16% were farmers, and a significant majority, 64%, were housewives. When it comes to income, those who worked in the private sector or as farmers typically earned between 10,000 to 25,000 rupees per month. However, government employees tended to earn more, with their monthly income exceeding 30,000 rupees.

Drinking water sources in Singhpura

In the village of Singhpura, most households rely on borewell water for drinking. About 58% of households in Singhpura get their drinking water from borewells.



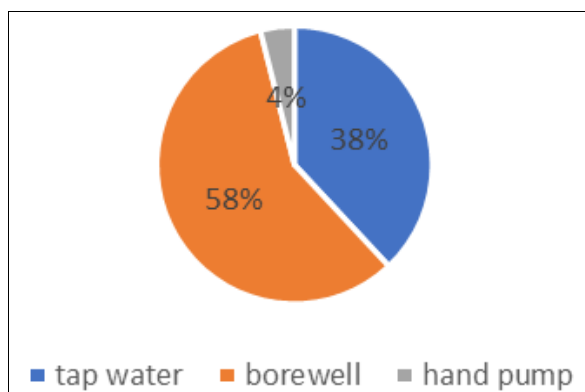
Plate 1: Singhpura Village, Community source of drinking water

Tap water is the second most common source, with 38% of households using it. Handpumps are the least common source, with only 4% of households using them for drinking water.

Table 1: Singhpura Village, Sources of drinking water

Sources of water	No. of house hold use	Percentage
Tap Water	19	38
Borewell	29	58
Hand Pump	2	4
Total	50	100

Source: Primary Field Survey of village Singhpura 2024.



Source: Primary Field Survey of village Singhapura 2024

Fig 1: Singhapura Village, Sources of drinking water

In Singhapura village, people use three main ways to get drinking water at home. The first way is by using community water. This water comes from outside the village through pipes underground. These pipes are connected to every home in the village. But not everyone in the village uses this water just for drinking. Many people use it for other things like washing or cleaning. About 74% of households in Singhapura use this community water, but only 38% of them use it for drinking. This means that most people prefer to use other sources for drinking water. However, there are some parts of the village where this community water doesn't reach. This could be because there's not enough pressure in the water pipes to reach those areas. Also, in some areas of the village, there are no pipes at all, so people there have to find other ways to get their

drinking water.



Source: Primary Field Survey, 2023.

Plate 2: Singhapura Village, Another community source of drinking water

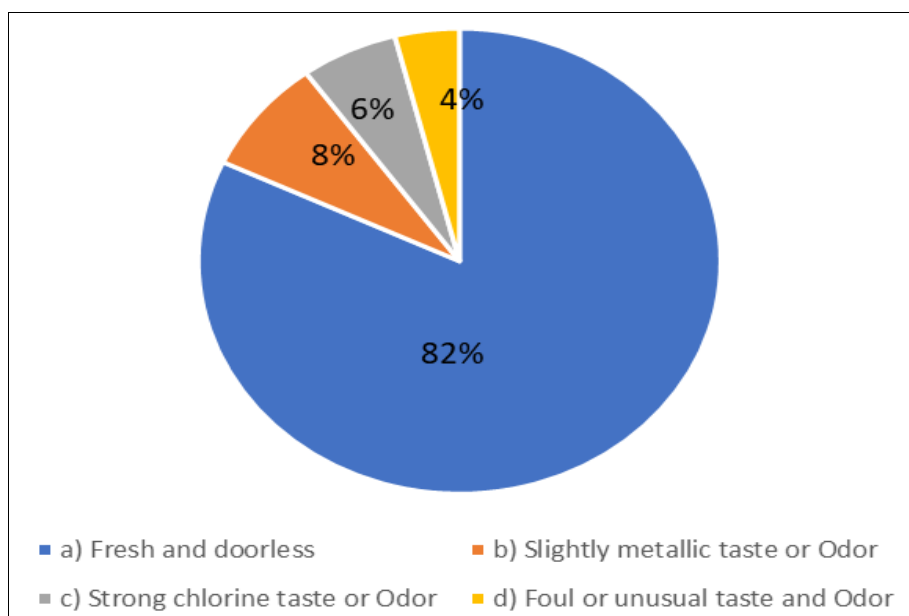
Quality assessment of drinking water

In the village of Singhapura, most people think the drinking water is good. Around 82% of households say the water is fresh and doesn't smell bad. But some people, about 8%, say the water tastes a little like metal and smells funny. They think this happens because the pipes underground isn't in good condition, especially for those who use water from the community source or borewells. Sometimes, there's a strong taste of chlorine in the water, according to 8% of households. Another 4% say the water tastes and smells bad, possibly because of the pipes underground. So, while most people think the water is fine, there are some problems with how it tastes and smells for others, mainly because of issues with the pipes.

Table 2: Singhapura village, taste and odor of water

Taste and Odour	No. of household	Percentages
Fresh and Odourless	41	82
Slightly metallic taste or Odor	4	8
Strong chlorine taste or Odor	3	6
Foul or unusual taste and Odor	2	4
Total	50	100

Source: Primary Field Survey of Village Singhapura 2024



Source: Primary Field Survey of Village Singhapura 2024

Fig 2: Singhapura village, taste and odor of water

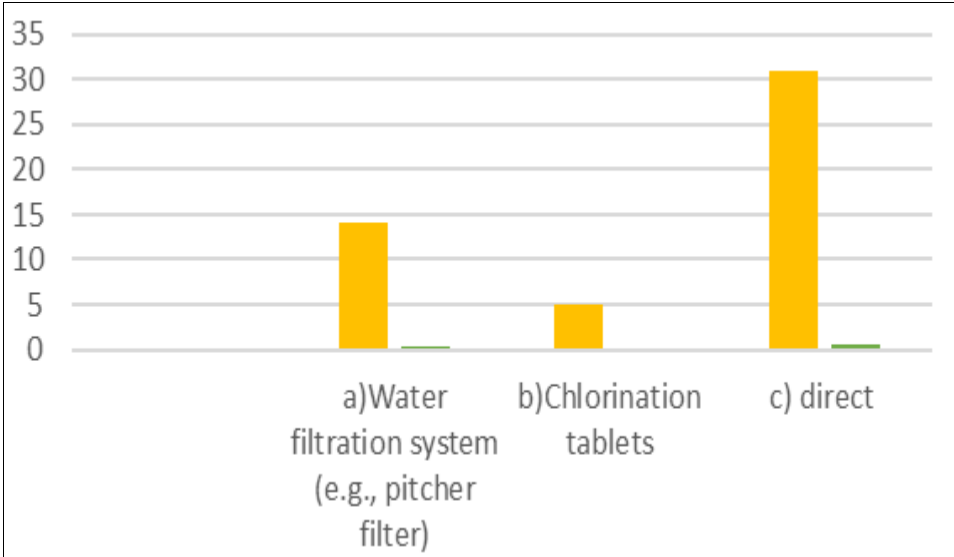
In the village, not everyone treats their drinking water before consuming it. About 62% of households simply use water directly without any treatment methods. A significant portion, around 28%, opt for water filtration or Reverse Osmosis (RO) systems in their homes. Additionally, 10% of households use chlorine tablets in their water tanks, mainly those who rely on borewell water. These tablets are used to disinfect the water and make it safer to drink. Each method has its own benefits and drawbacks in terms of effectiveness and convenience. While some prefer the simplicity of direct consumption, others prioritize the thorough filtration provided by RO systems or the disinfection offered by

chlorine tablets. Overall, these varied approaches reflect the diverse needs and preferences within the community regarding water treatment.

Table 3: Village Singhpura, water treatment method

Water treatment method	No of household	Percentages
Water filtration system (e.g., pitcher filter)	14	28
Chlorination tablets	5	10
Direct	31	62
Total	50	100

Source: Primary field survey of village Singhpura 2024



Source: Primary Field Survey, 2024.

Fig 3: Village Singhpura, water treatment method

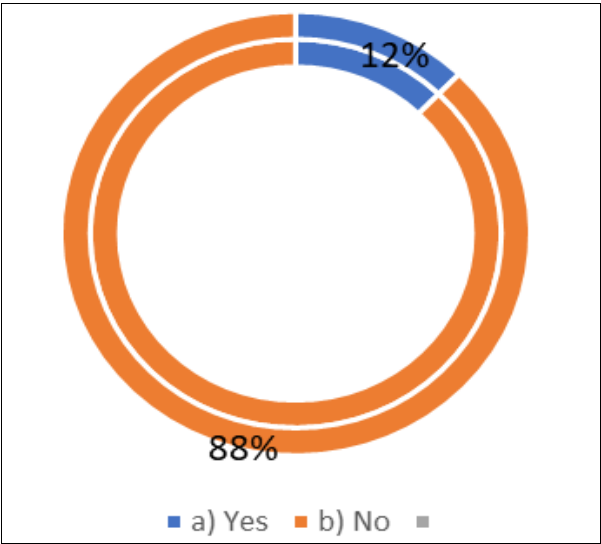
In Singhpura village, most people think the water is good, but there are problems for some households. For those who use the community water source, about 11% of them have health issues because the water sometimes smells strange, looks odd, or even tastes bad. However, it's important to note that 89% of households in the village don't have any health problems related to the drinking water. So, while there are some issues with the water for a few households, most people seem to be okay with it and don't face any

health concerns.

Table 4: Singhpura Village, health issues due to consumption of water

Health issues due to consumption of water	No of household	Percentage
Yes	6	12
No	44	88
Total	50	100

Source: Primary field survey of village Singhpura 2024



Source: Primary field survey of village Singhpura 2024

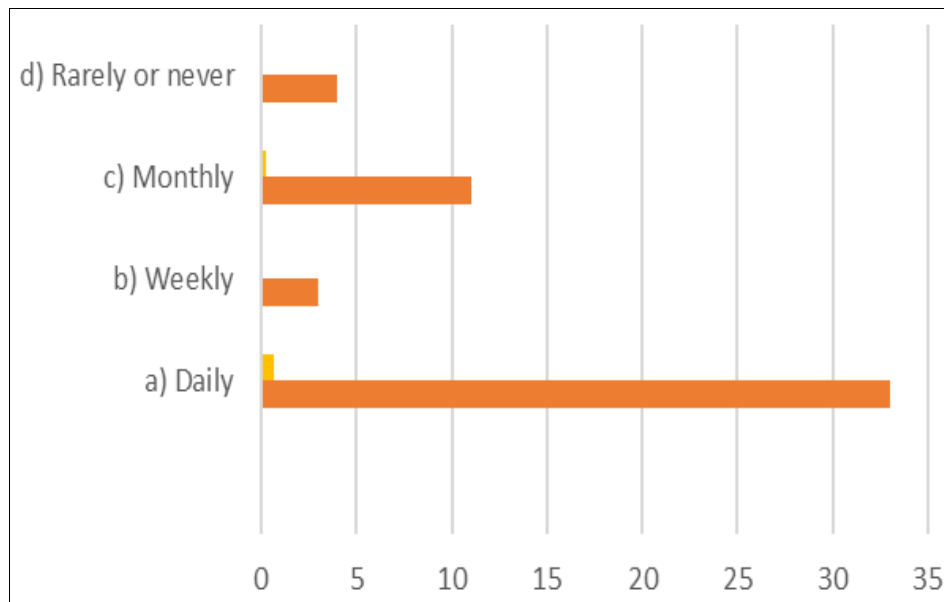
Fig 4: Singhpura Village, health issues due to consumption of water working properly.

Every person knows that the maintenance or cleaning of any containers of drinking water. Cleaning your home's water tank is really important to keep the water clean and safe to use. Over time, things like dirt, dust, Mold and even harmful bacteria, like Legionella, can grow inside the tank. This can make the water dirty and unsafe to drink or use. By regularly cleaning the tank based on a risk assessment, you can get rid of these harmful things, making sure the water is clean, safe, and follows all the rules. It's like giving your water tank a good scrub to keep everything healthy and

Table 5: Singhpura village, cleaning of water containers

Cleaning of water containers	No. of household	Percentages
Daily	33	66
Weekly	3	6
Monthly	11	22
Rarely and never	4	8
Total	50	100

Source: Primary Field Survey of Village Singhpura 2024



Source: Primary Field Survey, 2024.

Fig 5: Singhpura village, cleaning of water containers

In Singhpura village, most villagers store their water in pots, which they clean daily. About 66% of households follow this practice diligently, cleaning and changing their water pots every day. Some households refill their pots daily at specific times. A smaller percentage, around 6% of households, clean their water tanks or containers weekly. Meanwhile, approximately 22% of households clean their tanks and containers on a monthly basis. However, there is a concerning 8% of households who rarely or never clean their tanks or containers. Regular cleaning of water storage containers is crucial to prevent the buildup of dirt, bacteria, and other contaminants, ensuring that the stored water remains safe and clean for consumption. It's essential for the health and well-being of the villagers to maintain proper hygiene practices regarding water storage.

In Singhpura village, the quality of groundwater is a big concern. Many households rely on their own borewells for water, but the water often has a high level of Total Dissolved Solids (TDS), which can make it taste bad or smell strange. To improve this, most households use Reverse Osmosis (RO) systems at home to filter out the minerals and make the water safer to drink. This shows that while people have access to water, they face challenges with its quality, and they use filters to make it better for drinking. In Singhpura village, the level of Total Dissolved Solids (TDS) in water varies across different households. The lowest TDS value recorded was 68 PPM, but even this low level caused health issues like knee pain. On average, most households have TDS levels ranging from 400 to 800.

Table 6: Singhpura Village, water quality through TDS value

Sources	TDS	Quality
Middle of village bore well	1357 ppm	Very bad
Old community tap water	776ppm	Bad
New community tap water	512ppm	Bad
Outer side bore wells	750ppm	Bad

Source: Primary field Survey, 2024.

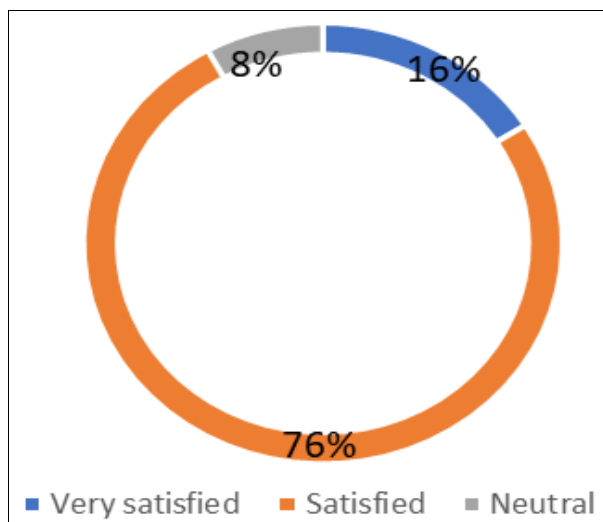
PPM, with some reaching as high as 1300 PPM, which can be risky for health. The highest TDS value, a dangerous 1357 PPM, was found in the centre of the village, posing significant health risks. As we move towards the outer boundary, TDS levels decrease to around 600-750 PPM, indicating slightly better water quality. The community water resource, consisting of two big borewells, shows varying TDS levels: One with a TDS of 776 PPM and the other, dug deeper at 900 feet, has a lower TDS of 512 PPM. These findings highlight the importance of monitoring and addressing water quality issues in Singhpura village to safeguard the health of its residents.

Table 7: Singhpura Village, satisfaction level with the quality of water

Satisfied of quality of drinking water	No. of household	Percentage
Very Satisfied	8	16
Satisfied	88	77
Neutral	4	8
Total	50	100

Source: Primary Field Survey of Village Singhpura 2024

In Singhpura village, the water temperature ranges from about 28 to 30 degrees Celsius. The new community water source has the highest temperature at 29.7 degrees Celsius. Other sources have slightly lower temperatures, ranging from 28.3 to 28.8 degrees Celsius. This means that the water from the new community source is a bit warmer compared to other 44 sources in the village. During the survey when asking to the household about the quality of drinking water. 16% if them are very satisfied, 77% are satisfied and 4% are neutral.



Source: Primary field survey of village Singhpura 2024

Fig 6: Singhpura Village, satisfaction level with the quality of water

Conclusion and Recommendations

In the village of Singhpura, people mainly get their drinking water from borewells, tap water, and hand pumps. Most households (58%) rely on borewell water, while 38% use tap water from pipes connected to their homes. Only 4% use hand pumps. Although community water is available through pipes, only 38% of households use it for drinking due to issues like low water pressure or lack of pipes in some areas. Despite most households considering the drinking water quality to be good, there are some concerns. About 8% of households notice a slightly metallic taste or odor, likely due to problems with underground pipes. Another 6% report a strong chlorine taste, possibly from water treatment. Additionally, 4% of households mention foul or unusual tastes and odors. While 89% of households do not have health issues related to the drinking water, 11% of those using community water do experience problems, indicating localized concerns.

When it comes to water treatment, 62% of households use water directly, 28% use water filters, and 10% use chlorine tablets, mainly for borewell water. Regular cleaning of water storage containers is common, with 66% cleaning daily, 6% weekly, and 22% monthly. However, 8% of households rarely or never clean their containers, which can be a health risk. To improve water quality and public health in Singhpura, it is important to address pipe-related issues, ensure effective water treatment, and promote consistent hygiene practices.

- **Improving water quality:** Many households in Singhpura village face challenges with the quality of groundwater, which can affect taste and smell. Using home filtration systems like Reverse Osmosis (RO)

helps make water safer to drink.

- **Infrastructure upgrades:** Upgrading treatment facilities and regularly testing water quality can help ensure clean drinking water. Installing more hand pumps, repairing existing sources, and extending pipelines can improve access to water.
- **Education and awareness:** Public awareness campaigns can educate residents on water conservation practices and the importance of maintaining clean water storage containers. Programs should be implemented to teach residents how to save water and utilize existing water conservation initiatives.
- **Government support:** Many residents believe the government should support water conservation efforts. Governmental support is crucial for implementing infrastructure improvements and public awareness campaigns.
- Overall, addressing these recommendations through a combined effort of infrastructure upgrades, education, and governmental support can ensure clean and reliable water for all residents of Singhpura village.

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