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A Study on Tap Water Supply in Rural Areas of Rohtak District, Haryana

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Abstract: ***Access to clean water is very essential for human health and sustenance of life. Water is primary requirement which is crucial for drinking as well other household activities. Government has been trying to develop water infrastructure over the years. In urban areas, water supply mechanism has gained significant progress but rural areas still lack the basic infrastructure of water supply. Haryana has been one of the states which provided piped water supply to all its villages in 1992. Recently, Government of India launched Jal Jeevan Mission (JJM) in 2019 for providing functional tap connections in each household of India. In October, 2021, Haryana claimed to achieve the milestone of providing clean water through tap connections in each rural household of the state. In this study, an attempt has been made to analyse the scenario of tap water supply in rural areas of Rohtak district of Haryana. With the help of field survey, different aspects of tap water supply have been studied to present the whole picture.***

Keywords: Drinking Water, Rural Areas, Tap Water, Quality, Supply

1. Introduction

Water is a valuable resource and essential for the sustenance of life. Access to water significantly affects the individual wellbeing and household hygiene. India since independence has been trying to provide basic needs and infrastructure to its inhabitants in urban and rural areas (Iyer, P.2018). In India, the water supply mainly depends upon two major sources - rivers and groundwater. So, depending upon the availability of water, level of development and government policy there are numerous sources of drinking water. Based on the availability of water, water sources can be divided into two types - (i) Surface water (ii) Ground Water. The surface water sources include canals, rivers, tanks, ponds, lakes, springs and harvested rainwater etc. While, the groundwater sources include tube - well, boreholes, hand - pump and wells. As per Census 2011, water sources have been divided into ten categories - (i) Tap Water from Treated Source (ii) Tap Water from Untreated Source (iii) Covered Well (iv) Uncovered Well (v) Hand pump (vi) Tubewell/borehole (vii) River/canal (viii) Tank/pond/lake (ix) Spring (x) Others. More than 80 per cent of rural households in the country use groundwater sources for drinking water (Singh, K.2018). Haryana was one of the earliest states to provide piped water supply to all its villages by 1992 (Singh K.2017). In the Rohtak district, tap water was the main source of water according to census 2011. For both domestic and drinking purposes, the majority of the population depend on piped water supplied by PHED. For a household with a piped water connection, the water requirement varies from 60 to 100 litres, depending on climatic circumstances, family size and food requirements (Gleick, 1996). In case of non - availability of pipe connection, the quantity of water consumed per person is influenced by the distance travelled and the time taken for the collection of water along with ensuring hygiene (Dwarakanath, H. D.2013). Water usage decreases by 5 - 10 litres per day when people travel more than 1 kilometer to fetch water (Howard et al, 2003). In general purview, the WHO recommends a minimum of 7.5 litres of for a person per day to meet most of the drinking needs. In India, a lack of water supply is a severe problem, with only 64% of households connected to stand posts and it generally takes 1 to 6 hours on average for water delivery (Ahluwalia, 2011). This study aims to analyse the status of tap water supply in different aspects in rural areas of Rohtak district. It focuses on parameters like the frequency, supply duration, average quantity and perception among households about quality of tap water. The study also highlights the different problems linked with tap water supply like leakage, shortage of water, water - deficit seasons etc. and gives suggestion to improve the availability and quality of tap water in the study area.

2. Material and Methods

The study has employed both primary and secondary data. The primary data has been obtained by personnel interview through a well - prepared questionnaire. This survey has collected data on both quantitative and qualitative aspects. The secondary data for this study has been obtained from Census of India, 2011, relevant journals, government reports and the official websites of the Ministry of Drinking Water and Sanitation, India and the Public Health Engineering Department, Haryana.

Multistage Stratified random sampling was used. First, among 5 blocks i. e., Meham, Lakhan Majra, Kalanaur, Rohtak and Sampla, 5 per cent of villages from each block were selected randomly i. e., a total of 7 villages. Further 5 percent households of the selected villages were selected which resulted into a sample size of 350 households.

2.1 Study Area

Rohtak is located in the south - eastern part of the Haryana state and lies between 28°40′46" N to 29°06′08"N latitudes and 76°12′ 40"E to 76°52′ 00"E longitude. Rohtak city is situated at a distance of 74 km. from the capital Delhi. It spreads over a geographical area of 1, 745 square kilometres. Out of this area about 94 per cent area constitutes the rural part and remaining which is just 6 per cent is urban part. Generally speaking, as that of Haryana,

the district has a sub - tropical continental monsoon type of climate. The district for the administrative convenience, divided into five community development blocks - Rohtak, Meham, Lakhan Majra, Sampla and Kalanaur (Fig.1). Out of the total population, about 58 per cent population lives in rural area and the remaining about 42percent is urban population. As per Census 2011, there were total 136 inhabited villages in Rohtak District. (Table - 1).

Table 1: Sampled Villages and Households

Blocks (5)	Total Villages (2011)	Sampled Villages (5 per cent)	Selected Villages	Total Households (2011)	Sampled Households
Meham	25	01	Nidana	707	35
Lakhan Majra	12	01	Kherainti	1, 186	59
Kalanaur	25	01	Kherari	626	31
Rohtak	52	03	Kahni 7 ½	249	13
			Bahu Akbarpur	2, 217	110
			Chamaria	877	44
Sampla	22	1	Samchana	1166	58
Total	**136**	**7**		**7028**	**350**
Source - Census of India (2011), House listing and Housing Census Data.					

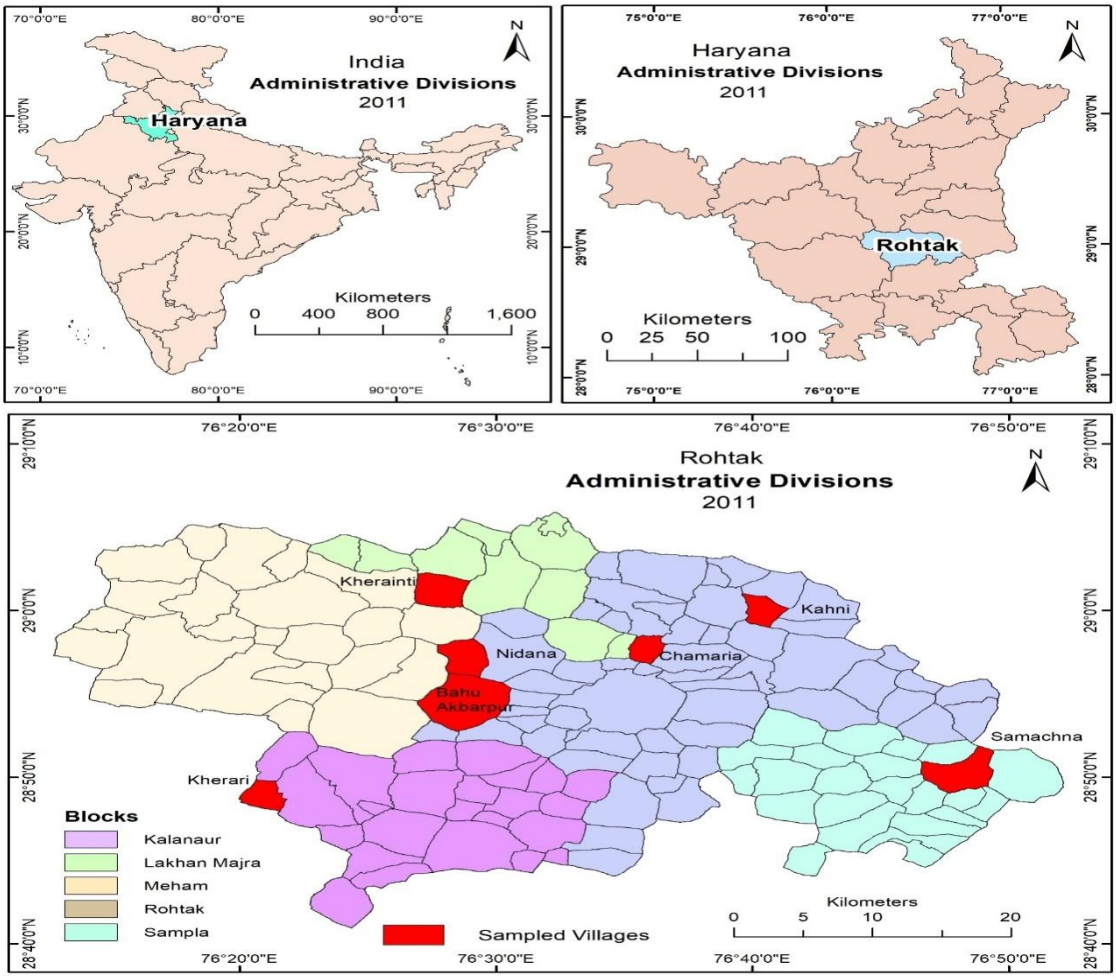

Figure 1: Location Map of Rohtak District and Sampled Villages

Source - Census of India, 2011

Tap Water Supply - 2011

Tap water is generally considered as safe and the most convenient source of water. In rural Haryana, the use of tap water has increased from 20.7 per cent in 1981 to 37.8 per cent in 2001 and 63.7 in 2011 (Census 2001, 2011). In Rohtak district, tap water has been found prominent source of drinking water that cover64 per cent of rural households collectively from treated and untreated sources. The change in the behaviour of residents towards tap water and its preference is mostly because of the expansion of tap water facilities and the convenience it offers to the households (Rani, M.2022). In Census 2011, among the villages, four villages namely Sarai Ahmed, Masudpur, Ghilor Khurd, and Taimur Pur has shown hundred percent coverage of households by tap water. On the contrary, Villages Sahan Majra has reported no household with tap water supply. Government of Haryana has vested responsibility of tap water connection and supply to the Department of Public Health Engineering Department (PHED).

3. Results and Discussion

1) Frequency and Supply Duration

In rural areas, one of the biggest challenges is the frequency and duration of drinking water supplies. In Haryana's rural areas, most households domesticate animals and hence require larger size of water storage tank. The department of public health and engineering has various restrictions on the frequency and availability of drinking water. The frequency and supply duration have been divided into five categories such as once in two days (20 - 30 minutes), once in two days (30 - 45 minutes), once in three days (20 - 30 minutes), and once in three days (30 - 45 minutes) and others as shown in Table - 2

The major part of the households about 39.04 per cent in Rohtak get water once in every two days for 20 to 30 minutes a day while 38 per cent of households are supplied water once in three days for 20 to 30 minutes (Table - 2). So, it can be concluded that nearly 80 per cent of households receive water once in two or three days for a time period of 20 to 30 minutes.

However, the scenario is better for those 11 per cent households which receive water once in two days and for the time duration of 30 to 45 minutes. Apart from that, there are 4 per cent of households where water supply is inconstant and unreliable.

Table 2: Rohtak Sampled Villages: Frequency and Supply Duration by PHED, 2021

Percentage of Frequency and Supply Duration						
Villages	½ per day	½ per day	1/3 per day	1/3 per day	Others	Total
	20 - 30Min.	30 - 45Min	20 - 30 Min	30 - 45Min.		
Kahni	13.33	6.67	53.33	26.67	0.00	100
Chamaria	66.67	18.69	12.14	0.00	2.50	100
Nidana	19.23	4.56	60.95	15.26	0.00	100
Kherainti	40.28	6.32	50.72	2.68	0.00	100
Samchana	68.26	5.62	22.69	2.23	1.20	100
Kherari	42.62	30.59	20.56	4.69	1.54	100
Bahu Akbarpur	22.92	5.63	42.67	8.22	20.56	100
Rohtak District	**39.04**	**11.15**	**37.58**	**8.54**	**3.69**	**100**

Source: Field Work, 2021

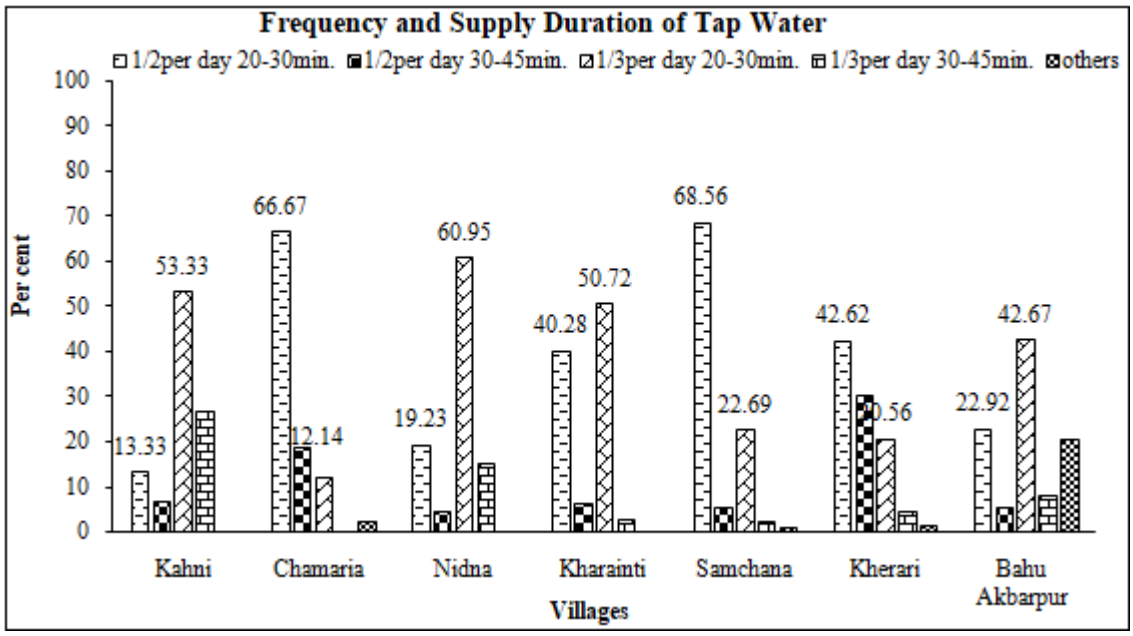

Figure 2: Frequency and Supply Duration of Tap Water

High Variability has been observed in terms of the frequency and supply duration across villages. Data analysis at village level says that Samchana (68 per cent) and Chamaria (67 per cent) households receive water supply once in every two days and for 20 to 30 minutes time period (Fig 2). Further, the supply is relatively better for frequency of once in every two - day in Kherainti and Kherari.

2) Average Quantity of Water Supplied by PHED

In Table - 3 the average quantity of drinking water supplied by PHED has been shown. Overall, only 39 per cent of households get sufficient water in rural Rohtak and no households reported to receive more than sufficient water. The major part of households (61 per cent) receives limited supply of water. Among the villages, households of Bahu Akbarpur (75 percent) and Nidana (72 per cent) highly reported limited supply of tap water. The situation is fairly good for households of Chamaria where only 38 per cent households expressed receiving limited water supply.

Table 3: Rohtak Sampled Villages: Average Quantity of Supplied Tap water

Average Quantity of Water				
Villages	Limited	Sufficient	More than Sufficient	Total
Kahni	53.33	46.67	0.00	100
Chamaria	38.62	61.38	0.00	100
Nidana	72.32	27.68	0.00	100
Kherainti	68.56	31.44	0.00	100
Samchana	52.45	47.55	0.00	100
Kherari	65.49	34.51	0.00	100
Bahu Akbarpur	75.63	24.37	0.00	100
Rohtak District	**60.91**	**39.09**	**0.00**	**100**

Source: Field Work, 2021

In Kahni and Samchana about 47 per cent households get that much water quantity which is sufficient for their requirement. The condition is rather poor in Nidana and Bahu Akbarpur where water supply is observed to be insufficient for most of the households as only 27 per cent households in Nidana and 24 per cent households in Bahu Akbarpur expressed their satisfaction.

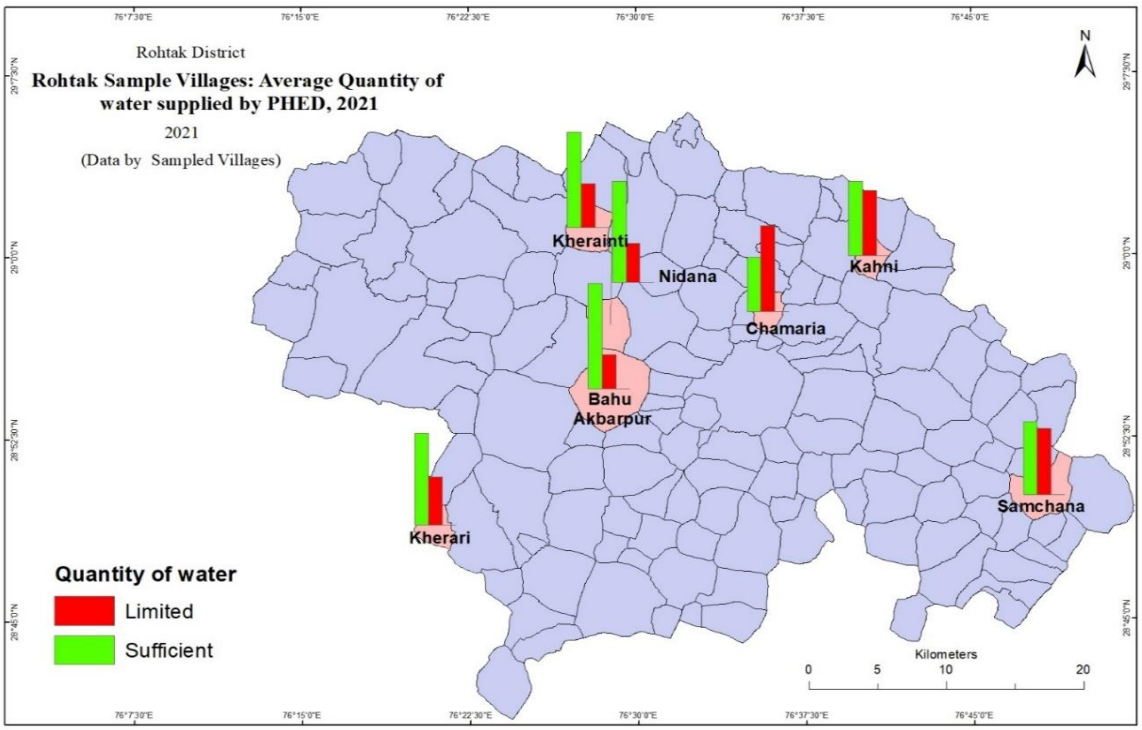

Figure 3: Rohtak District: Average Quantity of Tap Water, 2021

3) Problems During Water Collection

The study also throws lights on the concerns linked with the piped water supply. Table 3 illustrate some common difficulties encountered during collection of tap water. In the Rohtak district, these problems have been divided into three categories: poor quality, unreliable supply and insufficient quantity of water supply.

Table 4: Rohtak Sampled Villages: Problems during Water Collection, 2021

Villages	Poor quality	Unreliable supply	Insufficient quantity
Kahni	36.67	46.67	53.33
Chamaria	18.57	40.42	38.62
Nidana	32.52	52.62	72.32
Kherainti	55.65	58.67	68.56
Samchana	26.56	38.52	52.45
Kherari	30.39	32.89	45.49
Bahu Akbarpur	16.69	68.96	75.63
Rohtak District	**31.01**	**48.39**	**58.06**

Source: Field Work, 2021

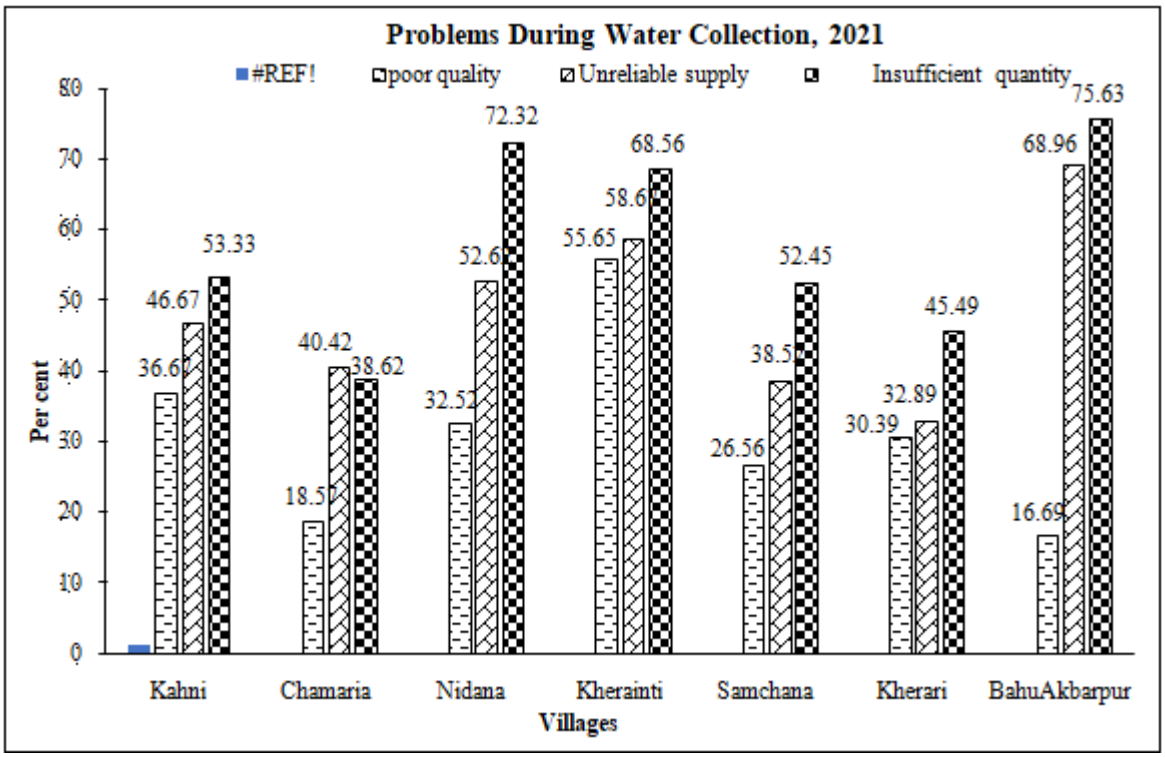

Figure 4: Problems during Water Collection Supplied by PHED, 2021

In the study area, what concerns more is the unreliable supply, poor quality of water and insufficient quantity. Analysis says that among the problems faced during water collection 58 per cent households are not getting sufficient water, 31 percent getting water of poor quality, 48 per cent households complained that water supply is unreliable. This indicates low availability and poor quality of water in the study area. The issue of poor water quality has been raised by the highest proportion (55 per cent) of households in village Kherainti followed by Kahni and Nidana. The problem of unreliable tap water has been noticed more in households of Bahu Akbarpur and Kherainti.

4) Season Specific Problems in Water Supply

India is a climate diverse country with four different seasons - Winter, Autumn, Summer and Monsoon. India receives major part of rainfall water in the monsoon season (June - September) which refills the Indian rivers. In India, piped water infrastructure is based on canal system constructed on different rivers. Water scarcity occurs in generally low rainfall seasons namely in summer and winter seasons.

Table 5: Rohtak Sampled Villages: Season Specific Problems in Water Supply

Seasons Related to Poor Supply of Water (in Percentage)				
Villages	**Summers**	**Winters**	**Rainy**	**Sometimes**
Kahni	46.67	13.33	13.33	33.33
Chamaria	32.63	0.00	6.38	16.25
Nidana	58.62	12.89	18.25	46.32
Kherainti	54.87	5.67	11.26	44.23
Samchana	42.63	0.00	8.52	37.57
Kherari	52.46	4.23	2.54	18.23
Bahu Akbarpur	67.52	13.54	5.62	62.23
Rohtak District	**50.77**	**7.09**	**9.41**	**36.88**

Source: Field Work, 2021

In Rohtak district, the problem of poor supply has been analysed under four categories: summer, winter, rainy and sometimes. As shown in Table - 4, about50 per cent of households in the selected villages face difficulty in terms of poor water supply in the summer season. Comparatively, the problems are less faced in the winter and rainy seasons due to enough availability of water in rivers and canal.

The problem of low or poor water supply in the summer season is faced by the highest number of households in Bahu Akbarpur followed by Kahni. It is noted from the Table - 4 that Bahu Akbarpur village faces difficulty throughout the year which specifically aggravates in summers.

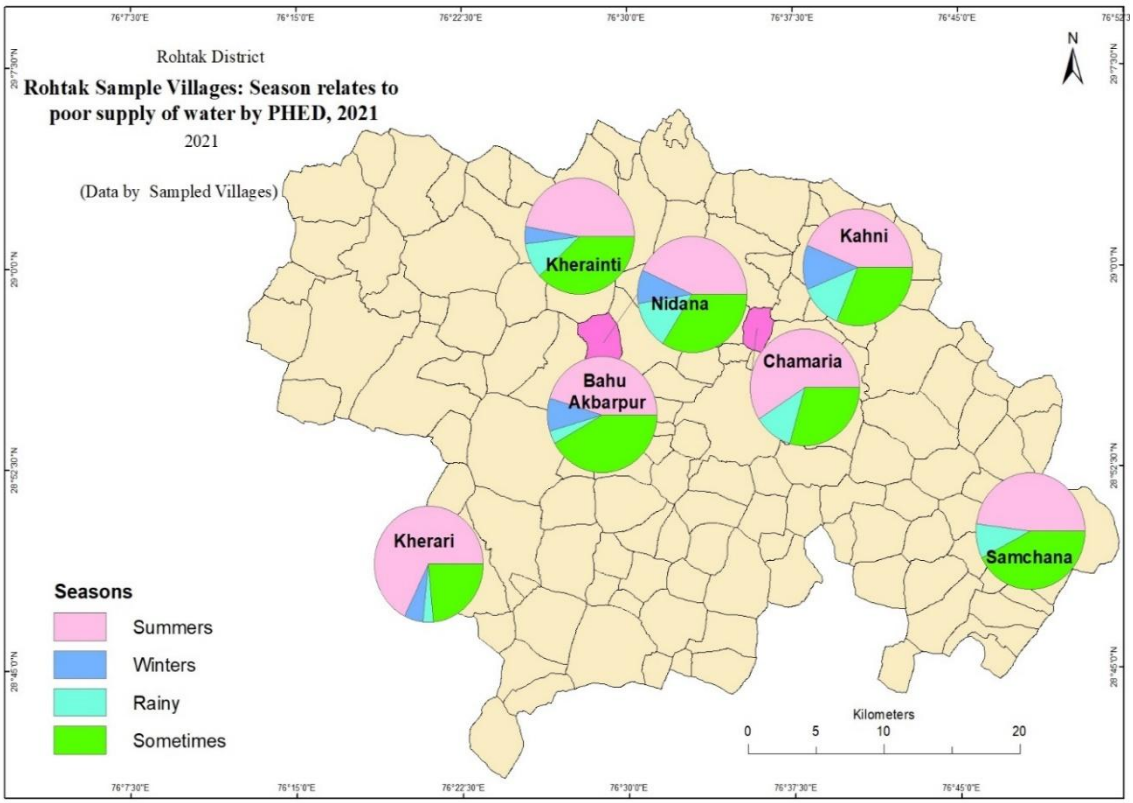

Figure 6: Season Specific Problems in Water Supply

5) Average Time Duration of Leakage Check by PHED Authority

Water loss and wastage of water are common problems associated with different water sources particularly tap water and tubewell. Worldwide, the annual water loss volume on a worldwide scale is enormous. According to estimates, every year, 126 billion m3 of water worth $39 billion is mismanaged, (Washali, T. et al.2016). A considerable percentage of this water loss owe to leakages in the water distribution networks (WDNs) which carry the capability of feeding 200 million people (Rani, M.2022). Leaks in the systems not only cause water loss but also contaminate water making it unfit for human consumption. Researchers and water supply companies have been actively investigating and controlling leaks for more than two decades.

Table - 5exhibits the average length of time taken by PHED to conduct and repair a leakage spot. Time lengths for leakage check and repair was divided into following time periods: fewer than 3 days, 3 - 7 days, 7 - 15 days, and more than 15 days. The mean time length of PHED leakage checks was more than 15 days as revealed by 57 per cent households, followed by 7 - 15 days with 28.62 %, and 3 - 7 days with 13.93 per cent. It is highlighted that in the Rohtak district, no household observed that leakage is checked within three days. More than 65 percent households of Bahu Akbarpur and Nidana villages have witnessed leakage checks for more than 15 days. Among all the villages, the problem of leakage check is observed to be early resolved in village Chamaria.

Table 6: Rohtak Sampled Villages: Average Time Length for Leakage Check by Authority, 2021

Percentage of Average Time Duration					
Village	< 3days	3 - 7days	7 - 15days	>15day	Total
Kahni	0.00	00.00	33.33	66.67	100
Chamaria	0.00	28.56	31.23	40.21	100
Nidana	0.00	12.62	21.06	66.32	100
Kherainti	0.00	2.89	40.88	56.23	100
Samchana	0.00	23.83	20.96	55.21	100
Kherari	0.00	7.26	43.51	49.23	100
Bahu Akbarpur	0.00	22.32	9.35	68.33	100
Rohtak District	**0.00**	**13.93**	**28.62**	**57.46**	**100**

Source: Field Work, 2021

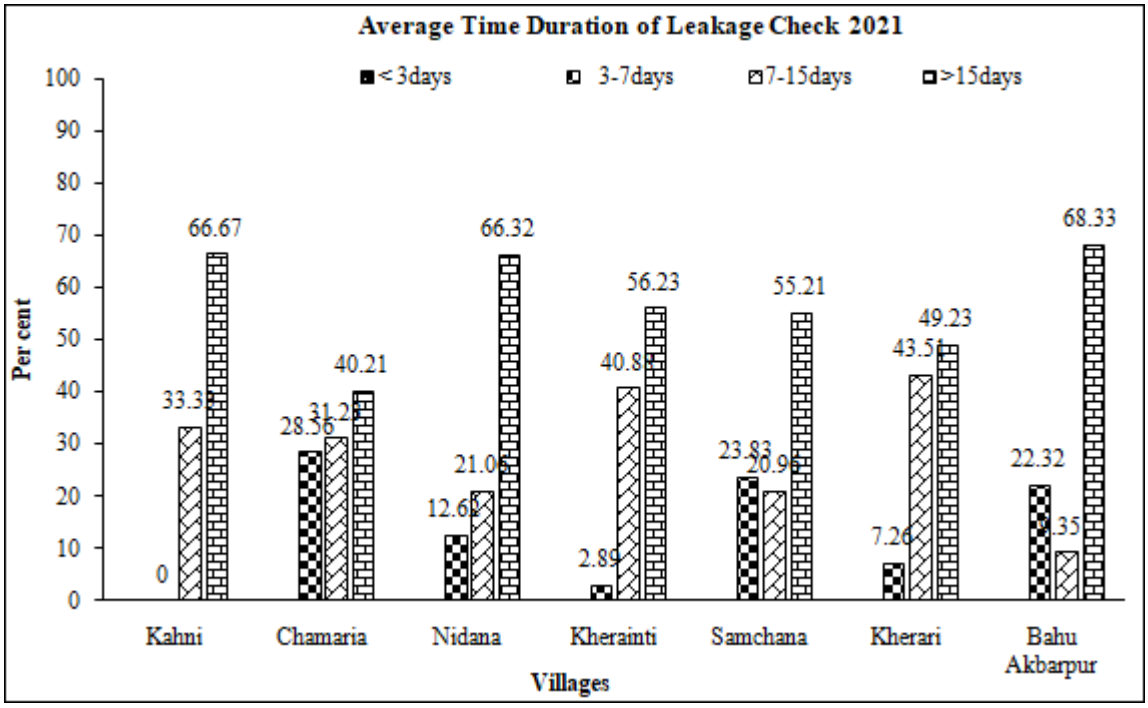

Figure 7: Average Time Duration of Leakage Check by Authority, 2021

The leakage check conducted by the authority is reported to have taken as fast as 3 to 7 days by more than 20 per cent households in each Chamaria, Samchana and Bahu Akbarpur villages. Kherainti and Kherari villages have only 3 and 7 per cent households respectively that confirmed checks been done in less than 7 days whereas none of the households in Kahni confirmed such prompt action by the PHED.

In the time period of 7to 15 days, the incidences have been highest in Kherari and Kherainti as mentioned by 44 and 41 per cent households respectively followed by Kahni and Chamaria villages where more than 30 per cent households confirmed leakage checks being done between 7 to 15 days. The delay in leakage check and repair indicates towards the negligence by the authority which is evident in every village.

4. Conclusion

The study has noticed that rural households in Rohtak district do not rely on tap water supply due to poor quality, insufficient quantity and irregular frequency. All the sampled villages acknowledged the institutional constraints in execution, operation and maintenance of the water supply system. Through the analysis of data, high disparity is observed across the villages in different aspects associated with tap water supply. Study didn't find many uniform trends and water supply varying considerably in terms of frequency and supply duration. However, the households certainly get water supply once in every two or three days at least for a period of twenty minutes. The condition of supply duration and frequency is rather poor in four villages of Chamaria, Samchana, Kherari, Bahu Akbarpur. In every village, more than 50 per cent households confirmed the unavailability of sufficient water. Across all the villages, households have to face problems with poor water supply throughout the year which specifically aggravates during the summer season with few occasional instances in rainy and winter seasons. Consequently, private water suppliers have emerged in Chamaria and Bahu Akbarpur which supply water to the households who can afford or are aware of importance of clean water.

The disparity is observed at household level as respondents reported variations in terms of frequency, supply duration, average quantity and quality within village itself. This variation is observed due to differences of location, socio - economic status and awareness level of a household. The household with high income level and households of small size do not face many difficulties. On the contrary, large families and households with low level of income, face problems in accessibility of sufficient clean water and storage capacity. As a result, the households have to make efforts on their own to arrange water for drinking and other purposes. Mostly, it is observed that households collect water from two different sources for drinking and other needs and availability of water sources. A holistic and community - based approach is required to provide tap water to every rural household. State government and district administration need to focus on sufficient and sustainable supply of clean water in all the villages. Villages Bahu Akbarpur, Nidana and Kherainti need special attention.

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