



DOMESTIC WATER SUPPLY AT HOUSEHOLD LEVEL IN MAHENDERGARH DISTRICT: A CASE STUDY OF RURAL CONTEXT

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Abstract

Water plays a vital role in the household of rural areas of India. In India there are certain regions of water deficiency and people are under severe stress. The piped water supply under the Jal Jeevan Mission is playing transforming role in the rural Haryana. The Piped water supply dynamics has been important in the life of the people since water availability, water supply duration and tap connections have direct impact on the social life of the villagers. Present work is based on the primary survey of 24 villages of 8 blocks with 388 respondents. The villages are selected out of 370 villages through fishnet method with the help of ArcGis. This paper focuses on the condition of domestic water supply in Mahendragarh district of Haryana state which is uneven in nature. In Mahendragarh water sources proximity is not equal and are subject to be categorized as per location of the households. The field survey has been conducted through structured schedule questionnaire. Proper presentation with the help of MS-Excel diagrams, tables and graphs are prepared to explain the status of domestic water supply at household level in Mahendragarh district.

Keywords: Domestic Water Supply, Water Availability, Duration, Tap Connections, Frequency.

Introduction

Water is a limited source on the mother planet, upon which 1/3rd third of the world's population lives in water-stressed regions however, just one per cent of the world's water is available for human use, 2 per cent is frozen in glaciers and polar ice caps and the rest 97 per cent is salty sea water (Sulaiman, 2012). The importance of water never appreciated by the humans and the proportion of such people have grown with time (Paramasivan and Sacratees, 2013). In semi-



urban municipalities of developing countries, the groundwater is been replaced as basic source to household drinking water instead of wells, streams and springs which became secondary sources in present days. These sources are vulnerable to poor hygienic conditions and sanitation prevail causing persistence and recurrent waterborne diseases (Basu et al., 2016). Uneven spatial and temporal occurrence and distribution of water resource because of climate variability and demand particularly for the drinking water, which is tied to level of urbanization and development, population distribution, per capita consumption and socio- economic factors is big challenge (Ali and Terfa, 2012). Every 20 years, worldwide water use doubles, more than double the pace of human population growth. Among the developing countries in India 17.5 per cent of the world's population are using 4 per cent of the world's available water. In India, half of the communities do not have access to protected drinking water (UNICEF, 2019). Primary goal of the state and local administration is to provide piped water to the rural population (Government of India, 2016) under the Nal-Jal Yojana and Jal Jeevan Mission implemented by the Central and State Governments (Jal Jeevan Mission, 2019), despite the fact that drinking water is a state matter under the Indian Constitution. With the foundation of a Technology Mission on Drinking Water in 1986, the programme was given a Mission approach, which was eventually called Rajiv Gandhi National Drinking Water Mission in 1991-92. The source and infrastructure that distributes water to households is referred to as domestic water supply. A well, a borehole with hand pump or tube well, a rainwater collecting system, a piped water supply with tap stand or house connection, or water vendors are all options for domestic water sources. Access to household water sources is one of the most fundamental prerequisites for human life (Gleick, 1996). Under current conditions, utilisation of local freshwater resources (groundwater and surface water) has 70-99 per cent lower impacts than off- grid desalination as the latter relies on electricity from diesel (Aberilla et al., 2020). Water and sanitation improvements, paired with changes in hygiene behaviour, can have a significant influence on the community. The need of adequate water quantity for human health has been recognised for many years, and there has been much debate over the relative relevance of water quantity, water quality, sanitation, and hygiene in protecting and enhancing people' health (Sandiford, et al., 1990). Domestic water supply includes uses such as drinking water and sanitation, both of which are critical for a continuous supply. As a result, hand pumps and taps are the most prevalent sources of water in the country, as they are used by the majority of the people.

As an arid and semi-arid locational existence Haryana is struggling with the water resources in the piped water supply form especially in the rural areas. The water sources are estimated very thin in which ground water has been declined by 35cm per year (Chatterjee and Purohit, 2009). Haryana receives rainfall annually around 545mm against the 1500mm of rainfall as per environmental demand. The growing population and its pressure along with climate change, absence of recycling and conservation increased the gap of demand and supply.



Water problems is a general phenomenon in the Mahendragarh district because it lies in the southern side of the state where it shares boundaries with Rajasthan where regional assessment are arid and semi-arid in nature. The water resources are limited and domestic water consumption is increasing day by day. To meet the demand the supply is a challenging task is for the authorities incorporated in it. The Jal Jeevan mission which doesn't supports the adequate water condition. Jal Jeevan mission and Nal-Jal Yojana have been successful in the rural areas where almost 95 per cent of the household are connected to tap connections supplied locally. The tap water connection incorporates proximity of water sources and duration and frequency of water supply in rural areas.

Table-1, Number and Percentage of Households by main source of Drinking Water in India and Mahendragarh, 2011

Sr. No.	Sources of Drinking Water Supply	India (hh)	Mahendragarh (hh)	hh (%)
1	Hand pumps	7,32,45,349	2196	1.3
2	Tap Water From Treated and Untreated Source	5,17,05,165	108389	64.32
3	Covered and Uncovered Wells	2,23,33,658	7095	4.21
4	Tube wells or Bore Wells	1,38,98,837	37955	22.52
5	Tank, Ponds and Lakes	17,71,796	5698	3.38
6	Rivers and Canals	14,12,565	60	0.04
7	Springs	11,84,498	51	0.03
8	Other Sources	22,74,862	7081	4.2
Total No. of Households		16,78,26,730	1,68,525	100

Source: Census of India 2011

For the year 2011, Table 1 shows the data on drinking water supply sources in India and Mahendragarh, respectively. According to Census of India 2011 statistics, the primary sources of drinking water in rural India are hand pumps, tap water, and tube wells. In India, there are a total of 16, 78, 26,730 households where Hand pumps are used by 7,32,45,349 households, covering 44 percent of the population's water needs. Water from treated and untreated sources is used by 5, 17, 05,165 households, accounting for 31 per cent of total water consumption. Hand pumps and tap water are the most prevalent sources of water in rural areas, as they are used by the majority of the people. It was also determined that 2,23,33,658 households utilize covered and uncovered wells to meet their water needs, accounting for 13 per cent of all households.

However, groundwater levels have been decreasing in many parts of the country in recent years,



and well production is insufficient to provide excellent water quality and quantity. Other sources of drinking water, such as springs, ponds, rivers, and canals, account for 1 per cent of total water use and contribute to the population's water needs. There are 1,68,525 households in Mahendragarh who receive water from different types of sources. Hand pumps provide water to 2196 households which are 1.3 % of the total households. 108389 households in the district get tap water from treated and untreated sources, which is 64.32 per cent of the district total water demand. The total number of households that uses covered and uncovered wells is 7095, which meets 4.21 percent of the district's water needs, while tube wells and bore wells account for 37955 households which is 22.52 percent of the district's water needs. Tanks, ponds, and lakes account for 3.38 percent of total water demand, with 5698 households, whereas rivers and canals account for 0.04 percent of total water demand, with 60 households. There are just 51 households which are dependent on springs in Mahendragarh, accounting for 0.03 percent of the total water demand. Water from other sources is particularly important since it accounts for 4.2 percent of the overall water demand, which adds to 7081 households.

Objectives:

The study area includes villages and households where water proximity, duration and frequency of piped water supply are important variables. The research paper includes the following objectives:

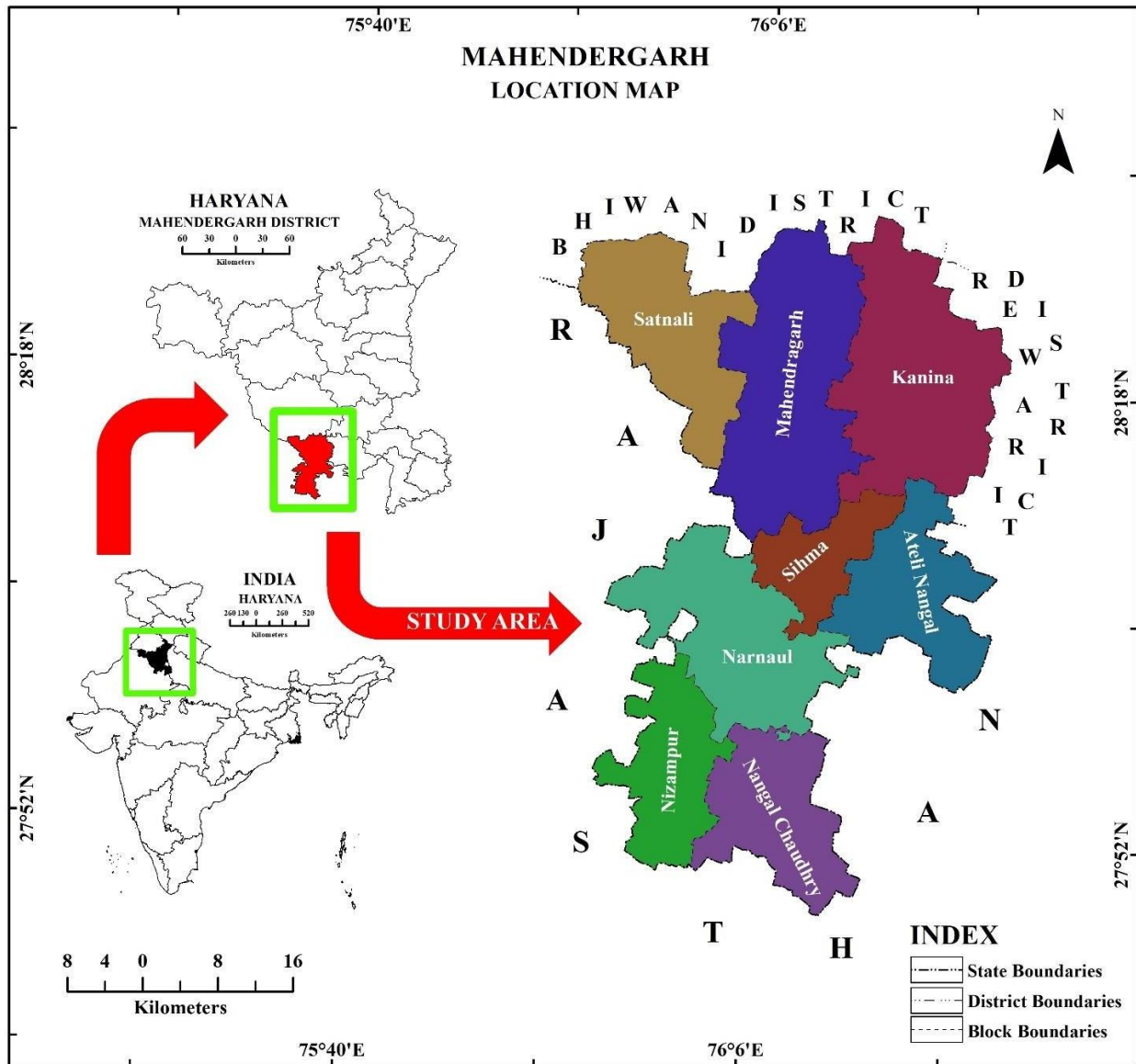
1. To evaluate the piped water proximity in the surveyed villages.
2. To analyze the duration and Frequency of the piped water supply.

Study area

The Mahendragarh district is located between the longitudes of 75°53'38" to 76°22'7" E and latitudes of 27°47'47" to 28°28'12"N. It is bordered by the districts of Bhiwani and Rohtak in the north, on the east by the districts of Rewari and Alwar in Rajasthan, on the south by the districts of Alwar, Jaipur, and Sikar in Rajasthan and on the west by the districts of Sikar and Jhunjhunu in Rajasthan. Mahendragarh is situated in the semi-arid area of Haryana. The district is 1948 sq. km. in size with latitudes ranging from 27°47'47" N to 28°28'12" N and longitudes ranging from 75°53'38" E to 76°22'7" E in the state of Haryana (Figure 1). Administratively, the district is divided into 8 blocks and 370 villages. The arid and semi-arid natural conditions are at its peak in the southern part of the district where it share this nature the most. Whereas geography of the district is peculiar. Rolling grasslands, sand dunes, and rocky outcroppings make up the district's topography. The residuals of the Aravalli hills give the area a rocky aspect. The climate in the area is hot and semi-arid. The average annual rainfall in the region is less than 300 mm. The bigger the gap between rainfall and evapotranspiration, the lower the soil moisture and the more extensive and intensive the use of ground water resources. Due to a shortage of

monsoon rainfall and progressively dwindling water supplies, the area has previously faced drought.

Figure 1, Study Area Location Map



Source: Survey of India (Toposheets) 2010 and Census Of India, 2011



Sampling, data and methodology

Data and methodology is the base of any kind of research work, without this the full dimension of research cannot come out. In 2020-21, this research is a cross-sectional study of domestic water supply in the Mahendragarh district. Secondary data is collected through the website of Jal Jeevan Mission, Department of drinking water and sanitation under the Ministry of Jal Shakti and Public health engineering department, Haryana. The Primary survey is based on legitimate questionnaire, has been conducted in Mahendragarh district including 24 villages under the 8 different community blocks based on fishnet method. Against the 9708 household of selected villages, 388 households were finalized for the survey, which is 4 per cent of the total sample size. Stratified Sample method (Table-2), and the practicality of the sample size is assessed using the aforementioned formula;

$$N = Z^2pq/d$$

Where,

$z = 1.96$ (at 95% confidence level),

$p = 94.66$ (domestic water supply in Mahendragarh),

$q (1-p) = 5.44$ (no domestic water supply),

d (absolute precision taken at 5%) = 0.058.



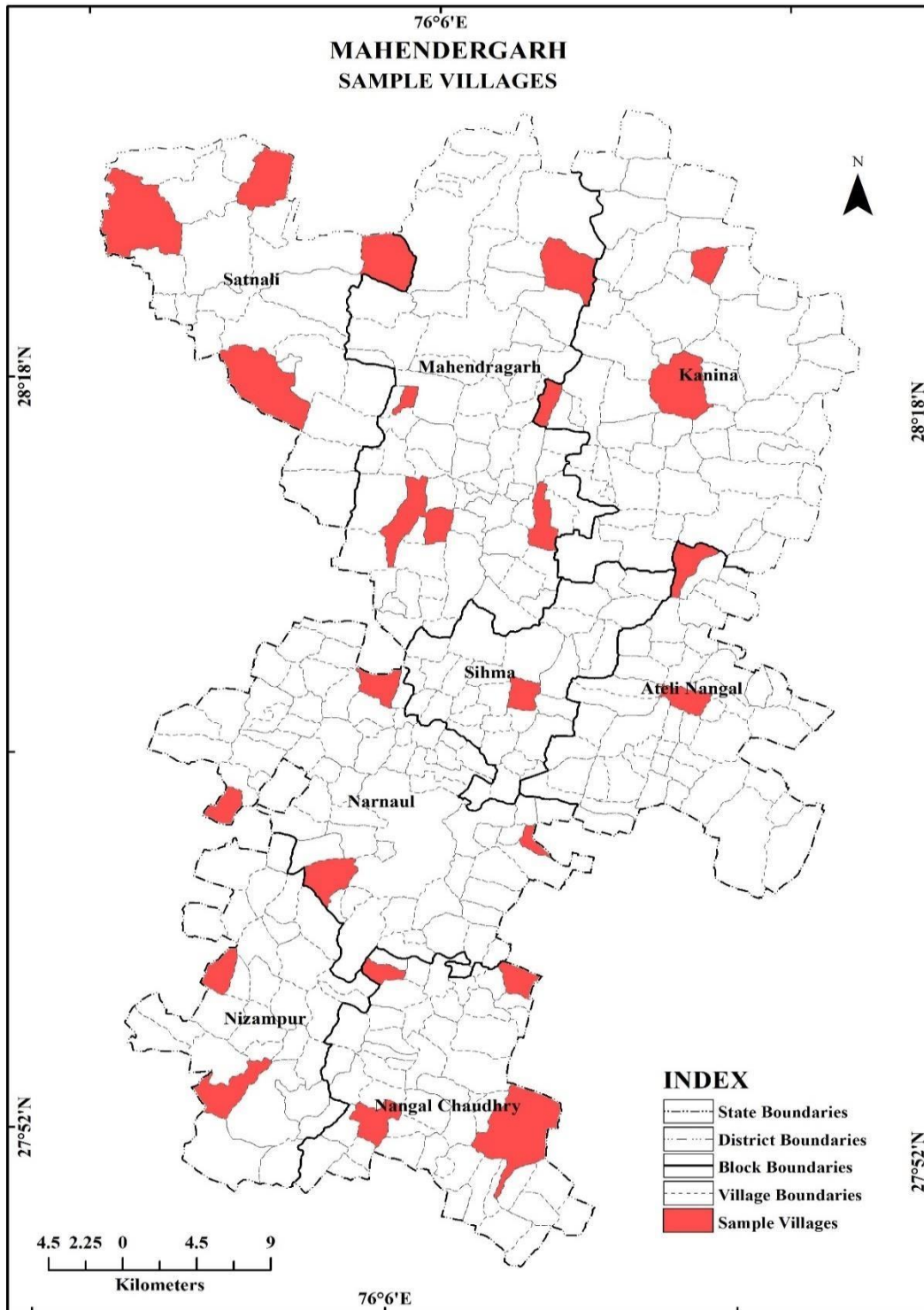
Table-2, Primary Survey Selected Villages, 2020-21

Sr.No.	Field Survey Villages	Blocks	Total No. of Household	Total No. of Selected Household
1	Nayan	Nangal Chaudhry	744	29
2	Shehbajpur	Nangal Chaudhry	431	17
3	Panchnota	Nizampur	316	13
4	Nizampur	Nizampur	350	14
5	Khatoli Ahir	Nangal Chaudhry	272	11
6	Akoli	Nangal Chaudhry	271	11
7	Shobhapur	Narnaul	269	11
8	Amarpur Jorasi	Narnaul	321	13
9	Badopur	Narnaul	319	13
10	Mehrapur	Narnaul	324	13
11	Bhori	Sihma	417	17
12	Khatripur	Ateli Nangal	214	09
13	Khairana	Ateli Nangal	382	15
14	Bhandor Unchi	Mahendragarh	425	17
15	Nimbi	Mahendragarh	480	19
16	Dalanwash	Satnali	534	21
17	Devroli	Mahendragarh	415	17
18	Sigri	Kanina	253	10
19	Gudha	Kanina	697	27
20	Chhitrauli	Kanina	301	12
21	Bawana	Mahendragarh	734	29
22	Nangal Mala	Satnali	266	11
23	Sohri	Satnali	377	15
24	Patharwa	Satnali	596	24
TOTAL			9708	N= 388

Sources: Researcher Calculation through Attributes Table in ArcGIS *Census, 2011.

Through the proportionate stratified Sample method the sample size of 388 (Table-2) was eventually tested at 95 per cent confidence level with the data obtained from 100% responses from the respondents. A basic water facility profile, as well as knowledge and practise questions on domestic water supply in the research area's households, were incorporated in structured questionnaires. The questionnaire was tested on around 4 per cent of the population size (Total Households in the 24 villages) with similar characteristics to the research region.

Figure 2, Location of Sample Villages, 2020-21



Source: Primary Survey and Observations, 2020-21



When unclear language, phrases, and queries were discovered throughout the sample, there were no missing responses such as "no response" and "others." As a result, patterns were resolved. Following that, sample households were given questionnaires to fill out at their residents. Figure-2 depicts the 24 villages and blocks in which they are located. Different number of respondents were chosen from each hamlet, and the responses were recorded and expounded on in the next section of the work. The respondents were physically contacted, and their comments were recorded and processed into tables and graphs using MS-Excel. The research used sample tools to create a questionnaire in the form of a timetable, and it was carried out through personal visits. A suitable purposive sampling approach was used because a sample frame of the residents of that location was not available. Face-to-face interviews were conducted, and more study volunteers were recruited until the target sample size was achieved. Information was acquired by interrogating an adult family member who was present at the time of the visit, as well as a physical assessment of the facilities by survey and observations. The information was gathered and entered into MS Excel for further analysis. Using data in percentage, variables of domestic water supply and factors related to it were investigated

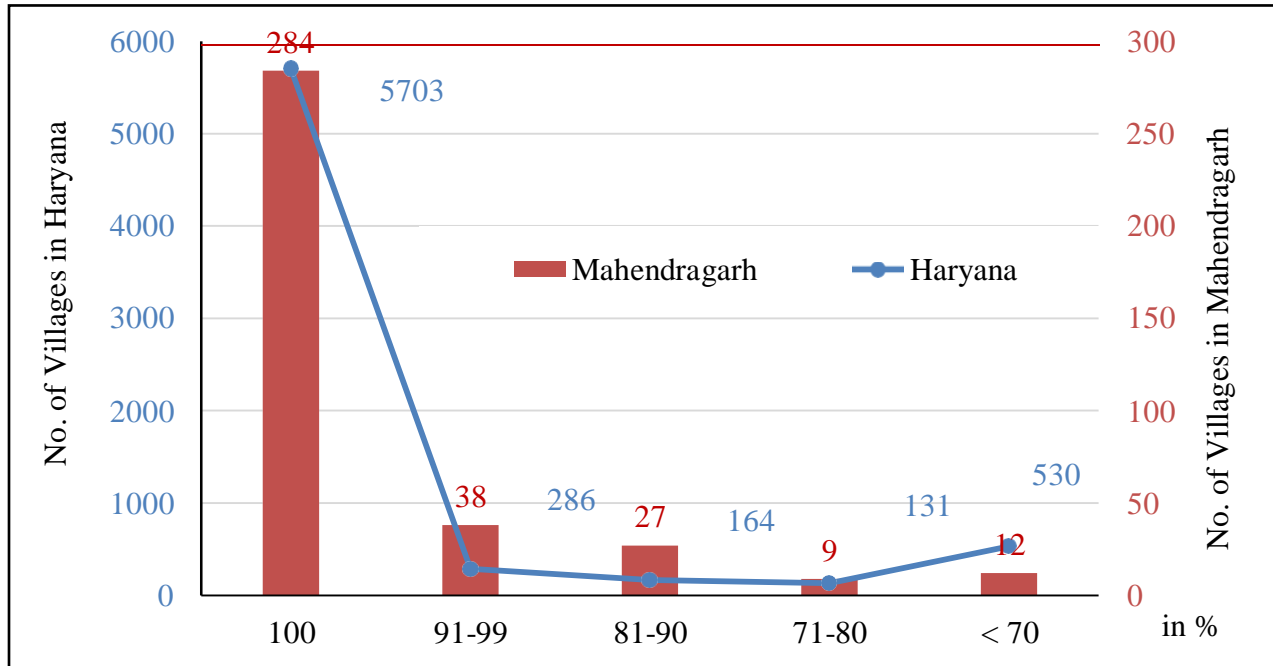
Results and analysis

The Water required for the household purposes are major aspect of water management on daily basis. Water supply in the Mahendragarh district has anomalies and subject to verity of elements associated with. The water supply immensely depends on number of tap connections in the Mahendragarh under the programme Jal Jeevan Mission and Har Ghar Nal Yojana. The Proximity of water sources from household, frequency and duration of water supply impacts on the daily water need of the people in Mahendragarh. The factors of water supply is based on 24 selected sample villages and data received during the primary observations are listed accordingly to draw results and analysis.

Tap connections in mahendragarh

According to the data taken from Jal-Jeevan Mission, 2021, households with tap connections accounts 92.80 per cent for the district, while those without tap connections account for 7.20 per cent. The surveyed villages are computed against the total households with and without tap connections in the Mahendragarh district as per the Jal Jeevan Mission statistics of 2021. Figure-3 depicts the status of functional household tap connections in Haryana and Mahendragarh, in which it is obvious that the functional household tap connection is highest in the >70 per cent category in India, while it is highest in the 100 per cent category in Mahendragarh and Haryana.

Figure 3, Status of Functional Household Tap Connections, 2021



Source: Jal Jeevan Mission as on 26.06.2021 (DDWS)

In Figure 3, 83.69 % of villages in Haryana and 76.75 % of villages in Mahendragarh district had functioning household tap connections, compared to 22.52 % of villages in India as a whole. In Haryana and Mahendragarh district, the majority of villages have fully functional household tap connections. Table-3, explains the availability of with and without Tap Connections in sample villages in Mahendragarh District. Table-3 further reveals that out of 9708 total households, 9009 households are equipped with tap connections whereas 699 households are without Tap Connections as per the Jal Jeevan Mission report, 2021. Household tap connections are more functional in Haryana and Mahendragarh district than the rest of India.

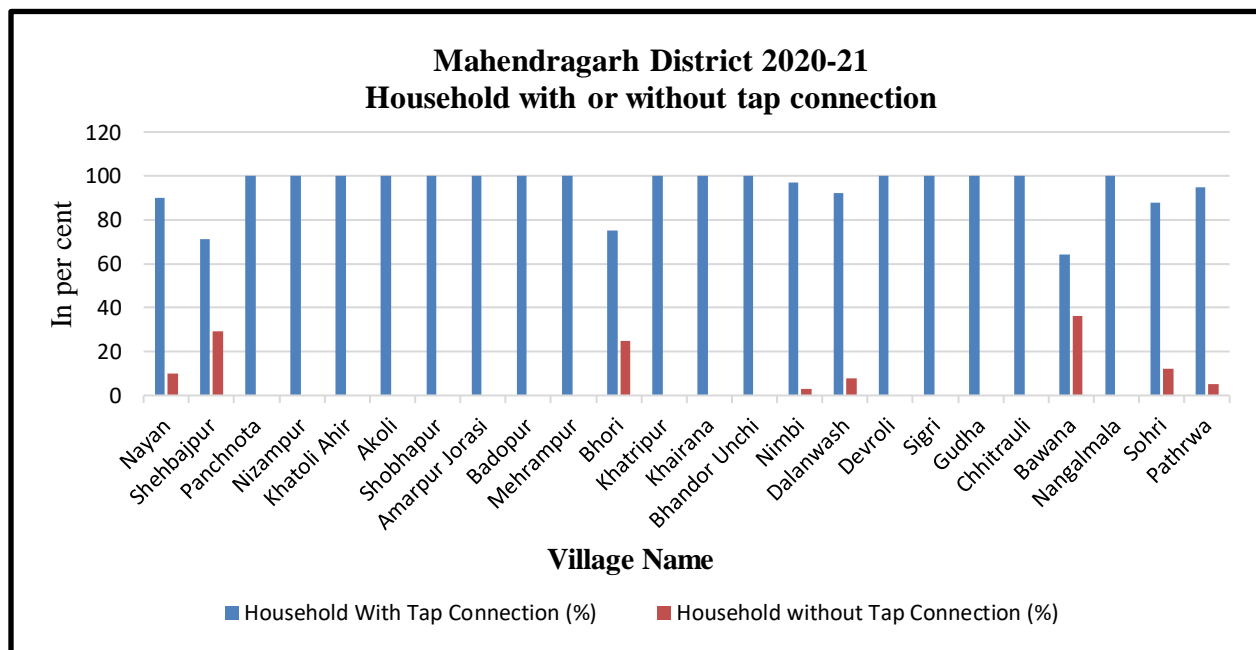
**Table-3, Households with or without Tap Connections in Mahendragarh, 2020-21**

Sr. No.	Village Name	Total No. of Household*	Household with Tap Connection		Household Without Tap Connection (%)	
			Number	%	Number	%
1	Nayan	744	670	90	74	10
2	Shehbajpur	431	306	71	125	29
3	Panchnota	316	316	100	0	0
4	Nizampur	350	350	100	0	0
5	Khatoli Ahir	272	272	100	0	0
6	Akoli	271	271	100	0	0
7	Shobhapur	269	269	100	0	0
8	Amarpur Jorasi	321	321	100	0	0
9	Badopur	319	319	100	0	0
10	Mehrapur	324	324	100	0	0
11	Bhori	417	313	75	104	25
12	Khatripur	214	214	100	0	0
13	Khairana	382	382	100	0	0
14	Bhandor Unchi	425	425	100	0	0
15	Nimbi	480	466	97	14	3
16	Dalanwash	534	491	92	43	8
17	Devroli	415	415	100	0	0
18	Sigri	253	253	100	0	0
19	Gudha	697	697	100	0	0
20	Chhitrauli	301	301	100	0	0
21	Bawana	734	470	64	264	36
22	Nangalmala	266	266	100	0	0
23	Sohri	377	332	88	45	12
24	Pathrwa	596	566	95	30	5
Total		9708	9009	92.80	699	7.20

Source: Jal Jeevan Mission as on 26.06.2021 (DDWS)



In different Mahendragarh villages, we also look at the proportion of families with and without tap connections. According to Jal Jeevan Mission statistics from 2021, villages like Nayan (670/744), Shehbajpur (306/431), Bhori (313/417), Nimbi (466/480), Dalanwash (491/534), Bawana (470/734), Sohri (332/377), and Pathrwa (566/596) have fell short to achieve 100% tap connection. The villages with the lowest performance among those examined are Bawana and Shehbajpur, with 264 and 125 households without Tap Connections, respectively. This data from Jal Jeevan Mission 2021, In 2021-22, the State plans to provide 4.09 lakh tap connections," Haryana is geared to provide tap water connection to all rural households by December, 2022, ahead of the national goal by 2024-25. By doing so, Haryana will be among the leading state to accomplish the ambitious target of providing tap connection to each rural household.



Piped water supply Proximity in Mahendragarh District

Water availability in Mahendragarh has increased significantly, with piped water being available to inhabitants in all 24 villages for more than 5 years; nonetheless, many communities continue to be without regular piped water deliveries. The closeness of a water supply is divided into two categories: (i) within the premises and (ii) outside the premises. In Mahendragarh district, 90.8 % of the water supply is provided within the premises, while 9.2 % is provided outside of the premises.

Table 4, Piped water supply proximity in Mahendragarh, 2020-21

Sr. No.	Village Name	Within Premises (%)		Outside of the Premises (%)		Total
		House front	Courtyard	0-250 m	250-500 m	
1	Nain	0	0	67	33	100
2	Shahbazpur	10	76	14	0	100
3	Panchnota	0	0	69	31	100
4	Nizampur	15	78	07	0	100
5	Khatoli Ahir	08	92	0	0	100
6	Akoli	10	90	0	0	100
7	Sobhapur	09	91	0	0	100
8	Amarpur Jorasi	07	93	0	0	100
9	Badopur	08	92	0	0	100
10	Mehrapur	08	92	0	0	100
11	Bhori	12	88	0	0	100
12	Khatripur	09	91	0	0	100
13	Khairana	13	87	0	0	100
14	Bhandor Unchi	05	95	0	0	100
15	Nimbi	11	89	0	0	100
16	Dalenwas	06	94	0	0	100
17	Devroli	12	88	0	0	100
18	Sigri	7	93	0	0	100
19	Gudha	08	92	0	0	100
20	Chhitrauli	06	94	0	0	100
21	Bawana	07	93	0	0	100
22	Nangalmala	A03	97	0	0	100
23	Sohari	05	95	0	0	100
24	Pathrwa	06	94	0	0	100
Avg.		7.70	83.10	6.54	2.66	100

Source: Primary Survey and Observations, 2020-21

Table-4 illustrates the close proximity of Piped Water Supply (PWS) in Mahendragarh district's 24 assessed villages. The availability of a piped water supply (PWS) in relation to residential location was evaluated during the initial survey. The PWS is split into two categories based on where it is located: (i) within the premises and (ii) outside the premises. The term "premises" refers to the physical location of a household's PWS connection point. If the PWS is located within the home or within the premises of the census house where the household is located, it is classified as within the premises. PWS has a radius of 100 meters in urban areas and 500 meters in rural areas, as defined by the Census of India, and is considered near to census household



premises. As a result of local variables and observations, during the primary survey, the outside of the premises was further separated into two classes: (a) 0-250 meters from the house and (b) 250-500 meters from the home. Within the premises, depicts two options: (i) house front with 7.70% water supply and (ii) courtyard with 83.10% water supply. Outside, the primes (i) 0-250 m cover 6.54% of the household and (ii) 250-500 m cover 2.66% of the piped water supply in the vicinity.

Piped water supply frequency and duration in Mahendragarh

Piped water supply is assured by the regularity with which water is delivered to the communities. Piped water supply is maintained in the examined villages on four different schedules: i) Once a day, ii) Twice a day, iii) Alternating days, and iv) Irregular. The frequency of water delivery for once a day is 50%, whereas it is 33.33% for twice a day. Water frequency is 8.33% on alternate days and 8.33% on other days.

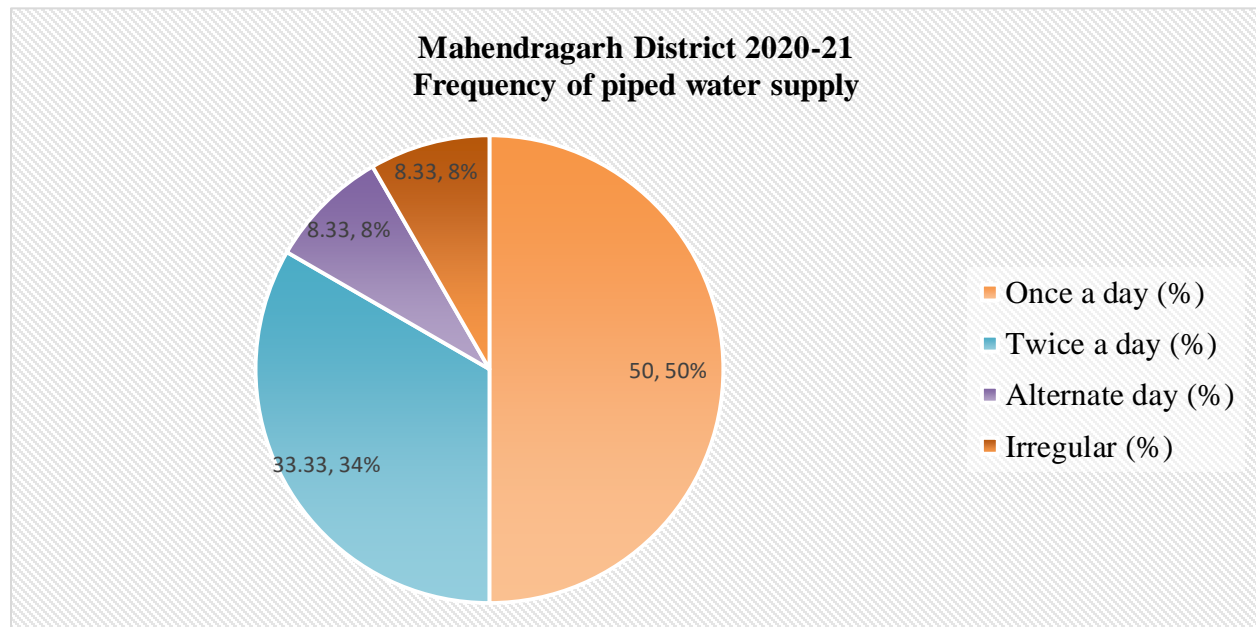
Table-5, Frequency of getting piped water supply in households, 2020-21

Sr. No.	Village Name	Once a day (%)	Twice a day (%)	Alternate day (%)	Irregular (%)
1	Nain	0	0	0	100
2	Shahbazpur	0	0	100	0
3	Panchnota	0	0	0	100
4	Nizampur	100	0	0	0
5	Khatoli Ahir	0	100	0	0
6	Akoli	100	0	0	0
7	Sobhapur	100	0	0	0
8	Amarpur Jorasi	0	100	0	0
9	Badopur	100	0	0	0
10	Mehrampur	0	100	0	0
11	Bhori	100	0	0	0
12	Khatripur	0	100	0	0
13	Khairana	0	100	0	0
14	Bhandor Unchi	0	100	0	0
15	Nimbi	0	0	100	0
16	Dalenwas	100	0	0	0
17	Devroli	0	100	0	0
18	Sigri	100	0	0	0
19	Gudha	0	100	0	0
20	Chhitrauli	100	0	0	0
21	Bawana	100	0	0	0
22	Nangalmala	100	0	0	0
23	Sohari	100	0	0	0
24	Pathrwa	100	0	0	0
Avg.		50	33.33	8.33	8.33

Source: Primary Survey and Observations, 2020-21



Table-5 shows that 8 villages (Khatoli Ahir, Amarapur Jorasi, Mehrampur, Khatripur, Khairana, Bhandor Unchi, Gudha, and Devrali) receive water twice a day, in the morning and evening, out of the 24 surveyed villages. In 8.33% of the villages, or two villages (Nimbi and Sehbajpur), water is only provided on alternate days, prompting residents to be concerned about their daily water needs. Apart from that, 8.33% (Panchnota and Nayan) have nothing to do with water supply frequency, but due to irregular water supply in these two villages, rural women bring water from round tanks built at various locations throughout the villages whenever the need for water is felt in the households. The frequency of water supply in villages was determined based on a baseline survey of Mahendragarh district villages.



The effective delivery of water services to households by guaranteeing that water is accessible in piped water supply sources is one of the most important aspects of domestic water supply. The number of hours of available water supply is therefore a critical factor in determining the quality of water provided to residents, allowing them to satisfy their needs without jeopardizing other aspects of their lives. Households have been receiving water from the network, and what percentage of them are satisfied with it? People in the assessed region receive water in numerous slabs, lasting up to 60 minutes. Water is provided to 62.51%, 29.16% of households for up to 120 minutes, and 8.33% (Nayan and Panchnota) of individuals are obliged to obtain water without any restrictions because the women of these villages have to go and fetch water themselves.

**Table-6, Duration of piped water supply in households (%), 2020-21**

Sr. No.	Village Name	Up to 60 min.	Up to 120 min.	No Timing
1	Nain	0	0	100
2	Shahbazpur	100	0	0
3	Panchnota	0	0	100
4	Nizampur	0	100	0
5	Khatoli Ahir	100	0	0
6	Akoli	0	100	0
7	Sobhapur	100	0	0
8	Amarpur Jorasi	0	100	0
9	Badopur	100	0	0
10	Mehrapur	100	0	0
11	Bhori	100	0	0
12	Khatripur	0	100	0
13	Khairana	100	0	0
14	Bhandor Unchi	100	0	0
15	Nimbi	0	100	0
16	Dalenwas	100	0	0
17	Devroli	100	0	0
18	Sigri	100	0	0
19	Gudha	100	0	0
20	Chhitrauli	0	100	0
21	Bawana	100	0	0
22	Nangalmala	0	100	0
23	Sohari	100	0	0
24	Pathrwa	100	0	0
	Class Avg.	62.51	29.16	8.33

Source: Primary Survey and Observations, 2020-21

Table-6 displays the daily water supply duration (in minutes) in Mahendragarh's 24 surveyed villages during primary survey and observations 2020-21. The table also illustrates the water supply across four time intervals that were recorded during the initial survey and field visit. Water supply up to 60 minutes is the longest and covers 62.51% of villages during total supply in a day, followed by water supply up to 120 minutes, which covers 29.16% of villages during total supply in a day.



Conclusion

The water has very important role in the daily life of the people of Mahendragarh. 92.80 per cent households have been attached with the household tap connections under the Jal Jeevan mission programmes whereas 7.20 per cent of the households are yet to be attached. The Tap connections embraces many factors, in which Availability of water sources, Proximity of water sources from the household and Frequency and Duration of Piped water supply plays vital role. The Proximity is been categorised as per the nature of households and the locational importance. The inside the premises of households 7.70 per cent is in the front of the household and 83.10% in the courtyard where most of the households prefers to have tap connections. In the outside the premises of households 0-500 m is the limit from where they fetch water for their household needs. The frequency of piped water supply in the Mahendragarh half of the households in 12 villages are receiving water one time a day which is satisfactory, but 1/3rd of the households in 8 villages are having water frequency twice a day which is good condition. 2 villages have water supply frequency on alternate days which is a poor condition. Whereas 2 villages have Irregular water supply which is the worst present condition. The condition of water supply duration is also uneven. The 62.51 per cent of water supply occurs in 60 minutes and 29.16 per cent of the water supply takes place up to 120 minutes whereas 8.33 per cent have no timing of water supply.

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