



Water Quality Level & Human Health (An Analytical Impact Study of Water Resources of Jhunjhunu District of Rajasthan)

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Abstract: *An attempt has been made in this paper to critically analyzing the quality of water resources of Jhunjhunu district of Rajasthan. Study points out that quality level of water in the specified area is according to the WHO parameters. But it also warns that, explosive growth in population, multiple uses of water, water resources, erratic rainfall and continuous depletion in the level of ground water and also partly due to increasing human activities, the quality of water is declining day by day. It further, suggests that to ensure making fresh water to the future generation – the efficient water management practices should be adopted.*

Key words – WHO, Water Resources, ph Value, Water management

Introduction

Clean, safe and adequate freshwater is vital to the survival of all living organism and the smooth functioning of ecosystems communities and economics. In real sense National Water Policy-2002 rightly mentions that water is a prime resource, a basic human need and precious national asset water is part of a large ecological system. Realizing the importance and scarcity attached to the fresh water. It has to be treated as an essential environment for sustaining all life forms. It also emphasizes that adequate safer drinking water facilities should be provided to the entire population both in urban and in rural areas. Irrigation and multipurpose projects should be invariably included in drinking water. Drinking water needs of human beings and animals should be the first charge on any available water. Fresh clean water is essential for human health. Currently degradation of quality of water is generating phenomena at national level. Rajasthan is not an exception of it. Various studies show that various sources of water being polluted due to various reasons, ground water is one of the important

source of drinking water which is understood to be very good source of pollution free water. Now, a days it is not free from contamination on the one hand because of the over exploitation of ground water, inorganic like fluorides and arsenic present below the ground find their way in to the extracted water and on the other hand pollutant's from surface sources reach in to the aquifers below. They cause fluorosis and arsenic poisoning. The extent of the water quality problem in Rajasthan may be judged from the fact that number of fluoride affected habitations is as high 16560. Similarly salinity affected habitations are 14415. Therefore in this paper an attempt is made to analyze the quality of water available to the public of rural areas nearby Jhunjhunu city of Rajasthan through the different sources viz-tube wells, hand pumps fresh water ponds and water reservoirs.

Objective of the Study

In Rajasthan owing to the scarcity of drinking water and the use of the same water sources for varieties of purposes the sources itself gets heavily polluted. These jackpots of disease carrying

pathogens and other pollutants, then wrought havoc in human communities depending on the afflicted water sources. Following are the main reasons behind under taking this study:-

1. To assess its quality to provide a pure and wholesome water to the public for drinking and other domestic purposes.
2. To find out whether a water is suitable for the specific industrial purpose and if not so, to choose the most efficient treatment.
3. To determine whether any pollution has occurred in a water sources and to trace the origin and extent of pollution and to suggest a possible remedy.
4. To determine the efficiency to words natural purification, when sewage and industrial wastes are discharged in to water resources.
5. To ascertain the effect of heavy rainfall of long continued drought.
6. To check the efficiency uniformity and consistency of treatment and purification process.
7. To find out the possibility and extent of mixing waters from two or more sources.
8. To find out whether intention by microbial organisms has occurred and if so to find out the particular organism to suggest preventive measures and effective disinfect in procedure.
9. Sewage and other wastes waters are analyzed to determine the influence of than on receiving waters and as far as

possible to protect the source from contamination.

Methodology

It is a multi-disciplinary study, in which chemical statistical are management techniques have been used for coming to concrete results. The quality assessment of water is generally done by conducting various tests on the samples of water collected. It is therefore obvious that the quality assessment includes two important things- sampling more analysis. Water samples from villages surroundings the Jhunjhunu city (manly Bissau, Mahensar, Luttu- Kolinda and Bagger) were taken. Four water supply zones were identified in these areas and 60 water samples (taking 15 samples from different areas of each zone) were randomly selected for the chemical analysis. These water samples were collected from tube wells, hand pumps, pump houses and water reservoirs. In this way pH. Values, Alkalinity, water hardness, chloride ,nitrate, iron, fluoride and TDS tests were made similarly different bacteriological tests were also carried out to examine the quality of water.

Profile of Area Under Study

Jhunjhunu is a town in the state of Rajasthan in India and the administrative H.Q. is Jhunjhunu district. It is located about 180 kms. from Jaipur. It's area is 5929 Sq. Kms. Most of the part of the district is semi-desert. The Aravali ranges are embracing the south –eastern part of the district. The huge and magnanimous copper fields are lying in the bowl of these ranges in Singhana and Khetri suburbs. The Jhunjhunu is a part of Shkhawati.

There is two natural division of the district namely:-

1. North and Western desert
2. South Eastern semi-desert

At many places desertification is also taking place.

The climate of the region is arid characterized by frequent drought. May and June are the hottest months when the main temperature hooks up to 41.6°C. The coldest month is January when the mean maximum and minimum temperatures are 22.5°C and 4°C respectively. The rainfall is scanty and irregular. It is mainly received during the monsoon months from July to September. Winter rains are negligible.

Wind velocity is quite high during summer and stand storms are a common feature of the area. The mean maximum and minimum velocity is 16.7 Km per hour in the month of June. The mean maximum wind velocity is 4.3 Km per hour in November. Following four villages were included under survey:-

1. Bissau:-

Bissau village is 40 Km away from Jhunjhunu city, situated on the Jhunjhunu Churu road in the west Jhunjhunu city, population is approximately 15000. The main sources of water are – tube wells, hand pumps, water reservoirs and rain water collected during monsoon for drinking and bathing purpose. Supply of ground water is also available for drinking bathing and irrigation purpose.

2. Mahensar:-

Mahensar village is 50 Km away from Jhunjhunu city situated on the Bissau- Mandela road.

Population is about 7000. Sources of water is tube wells, hand pumps, water reservoirs and rain water collected during the monsoon for drinking and bathing purposes supply of Ground water is also available for drinking bathing and irrigation purpose.

3. Luttu – Kolinda:-

Luttu – Kolinda village is 30 Km away from Jhunjhunu city situated on the road of Jhunjhunu – Bissau. Population is about 2300. Luttu project supplies were in the area of 25km. Main sources of water are tube well, hand pumps, water reservoirs and rain water collected during monsoon for drinking and bathing purpose. Supply of ground water is also available for drinking bathing and irrigation purpose.

3. Baggar :-

Baggar village is 12 Km away from Jhunjhunu city, situation on the road of Jhunjhunu – Chidawa population is about 12000. The tube wells hand pumps, water reservoirs and rain water are main sources of water, which are widely being used in this village.

Results and Discussion:-

Results so obtained from chemical and Bacteriological analyses of different water samples taken from these four zones are presented in Table –II, III IV V & VI. These results were compared with parameter laid down by World Health Organization as enunciated in the following tables:-

Table – I: Drinking water specification (IS-10-500: 1991)

(A) Essential Characteristics:-

S.No.	Characteristics	Desirable Limit	Permissible Limit
1.	Colour (Hazen Units)	5	25
2.	Odour	Unobjectionable	-
3.	Taste	Agreeable	-
4.	Turbidity (NTU)	5	10
5.	PH	6.5 to 8.5	-
6.	Total hardness (mg/l)	300	600
7.	Iron (mg/l)	0.3	1.0
8.	Chlorides (mg/l)	250	1000
9.	Residual Free Chlorine (mg/l)	0.2	-

(B) Desirable Characteristics (mg/l)

10.	Dissolved solids	500	2000
11.	Calcium	75	200
12.	Magnesium	30	75
13.	Copper	0.05	1.5
14.	Manganese	0.1	0.3
15.	Sulphate	200	400
16.	Nitrate	45	100
17.	Fluoride	1.0	1.5
18.	Phenolic Compounds	0.001	0.002
19.	Mercury	0.001	-
20.	Cadmium	0.01	-
21.	Selenium	0.01	-
22.	Arsenic	0.05	-
23.	Cyanide	0.05	-
24.	Lead	0.05	-
25.	Anionic Detergents	0.2	1.0
26.	Chromium as Cr 6+	0.05	-
27.	PAH	-	-
28.	Mineral Oil	0.01	-
29.	Alkalinity	200	600
30.	Pesticides	Absent	0.001
31.	Aluminum	0.03	0.2
32.	Boron	1	5

The comparative analysis of result obtained with drinking water specifications reveals that in all areas of under study quality level of water is

satisfactory. The quality status of water obtained by source also observed satisfactory except in the case of water ponds. As it is noticed that in

bacteriological point of view the waste water ponds were not suitable for animals and human being but water reservoirs were suitable for animals and irrigation. The pH of an aqueous system is a measure of acid base equilibrium contributed by several dissolved compounds but controlled by carbon – di – oxide – bicarbonates system. The pH has several other roles to play in aquatic system, but all these are not related to health aspects. A direct relation of the pH of drinking water and human health is difficult to determine as the pH of water has not been found to affect human health. The WHO (1984) guideline of pH in the drinking water is 6.5 to 8.5. The pH observed in the present study is 7.7 to 7.8 in all water samples examined. The range of pH shows that most of the waters are slightly alkaline due to the presence of carbonates and bicarbonates but according to WHO, it is safe for drinking purpose.

According to the degree of hardness the waters are commonly classified as follows:-

Hardness as CaCO_3 in mg/l	Classification
0-75	Soft
75-150	Moderately Hard
150-300	Hard
Above 300	Very Hard

According to WHO based categorization the nearby rural areas of the Jhunjhunu city (taken under this study) water could be considered moderately hard. The hard water has domestic disadvantage that it may require a considerable amount of soap to produce lather.

The health aspect of hard water is in association with magnesium and sulphate ions. These impart laxative properties to the water. Hardness also has some relation with cardio –vascular diseases varieties of diseases have been related to the

hardness of water. These include nervous systems defects ancephathy, prenatal mortality. As stated earlier hardness recorded in the present study is safe and suitable for drinking water similarly, the permissible limits of chlorides range from 200 mg/l to 600 mg/l. Almost all the values of studied samples of water in rural areas of Jhunjhunu city are not much higher than standard value.

The nitrate is an important consideration with regard to potable water. Excess of nitrates with excess of chloride indicates the sewage pollution. The values of nitrates in this investigation are normal.

Iron is frequent constituent of portable water and occurs in such minute quantities that its presence is ignored. In rural areas of Jhunjhunu city iron water sample is absent; therefore water is safe for drinking water purpose.

Natural land treated water vary in microbiological quality. Ideally the drinking water should not contain any micro organisms especially those known to be pathogenic. It should also be free from pollution indicative bacteria and these associated with animal excrete. In order to determine the bacteriologically safe drinking water coliform bacteria are considered as a whole. These may not be faecal in origin but are invariably present in human faces and also in those of other warm blooded animals. The faecal coliform is thermo-tolerant and classical example is of E. Coli. As per the WHO guidelines both types of coliform organisms, i.e. faecal and total coliform should be totally absent in the drinking water. The water of tube-wells and hand pumps of rural areas of Jhunjhunu city is not affected by the coliforms only 0 to 2 PFU/100 ml was occurred in few samples. Therefore, it could be summarized that water of

rural areas of Jhunjhunu city is safe for drinking in the light of WHO guidelines.

The fresh water ponds and waste water ponds show the high level of coliforms therefore the water of those reservoirs is not safe for drinking. The water of waste pond have the highest level of coliform and shows the highest degree of contamination such water cannot be used for irrigation except in limited condition. The water of fresh ponds is suitable for irrigation and animals.

Conclusion and suggestions:-

In summing up it is worth white to mention that however quality level of water is according to the WHO specification in areas taken under study. But explosive growth in population, multiple uses of water resource, erratic rainfall and continuous depletion in level of ground water and also partly due to increasing human activities making it's ill effect on water quality in Rajasthan in general and Jhunjhunu district in particular. According to Ground Water Department Jodhpur (Rajasthan) a maximum number of districts in Rajasthan show considerable depletion with a declining trend of more that 0.20 mt/year up to an extent of half meter per year. Amongst them, Jhunjhunu is also one district. Thus 76% are of the state is under depletion with the over exploitation of grand water, inorganics- like fluorides and arsenic present below the ground. Ensure making quality water to future generation- efficient water management practices should be adopted. In this connection traditional water harvesting systems must be revived and strengthened which must have evolved as specific response to ecology and culture used by to satisfy local needs in an environment friendly manner. More efficient use of water through public education may help.

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Table – II: Water quality parameter in randomly selected drinking water source of rural area nearby Jhunjhunu city (BISSAU)

S. No.	Name of Water Source of Location	pH	TH mg/l	CaH mg/l	Mg-H mg/l	CI mg/l	No ₃ mg/l	Fe mg/l	EC ds/m	MPN /100ml for total coliform
1.	Hand pump Bissau	7.8	117.04	78.00	39.04	53.25	6.00	Nil	0.97	0
2.	Hand pump Bissau	7.9	82.50	52.00	30.50	145.25	7.00	Nil	2.00	0
3.	Hand pump Bissau	7.5	127.24	76.00	51.24	390.50	6.00	Nil	2.60	0
4.	Water Reservoir Bissau	7.9	45.66	42.00	3.66	35.50	10.00	Nil	0.37	2
	Average	7.78	93.11	62.00	31.11	168.63	7.25	0.00	1.48	0.5

Source: Compiled by Authors

Table – III: Water quality parameter in randomly selected drinking water source of rural area nearby Jhunjhunu city (MEHANSAR)

S. No.	Name of Water Source of Location	pH	TH mg/l	CaH mg/l	Mg-H mg/l	CI mg/l	No ₃ mg/l	Fe mg/l	EC ds/m	MPN /100ml for total coliform
1.	Tube Well Mehansar	7.4	182.86	106	76.86	355	6.00	Nil	2.20	1
2.	Tube Well Mehansar	7.7	252.1	124	128.1	603.5	7.00	Nil	2.70	0
3.	Hand pump Mehansar	7.7	101.14	56	45.14	337.5	7.00	Nil	2.00	0

4.	Water Reservoir Mehansar	7.9	43.66	40	3.66	35.5	9.00	Nil	0.28	2
	Average	7.68	144.94	81.5	63.44	332.8	7.25	0.00	1.80	0.75

Source: Compiled by Authors

Table – IV: Water quality parameter in randomly selected drinking water source of rural area nearby Jhunjhunu city (LUTTU – KOLINDA)

S. No.	Name of Water Source of Location	pH	TH mg/l	CaH mg/l	Mg-H mg/l	CI mg/l	No ₃ mg/l	Fe mg/l	EC ds/m	MPN /100ml for total coliform
1.	Tube Well Luttu-Kolinda	7.9	74.94	42	32.94	139.75	7.00	Nil	1.54	1
2.	Hand pump Luttu-Kolinda	7.6	112.16	75	34.16	301.75	6.00	Nil	2.10	0
3.	Water Reservoir Luttu-Kolinda	7.9	57.72	52	5.72	55.5	10.00	Nil	0.32	2
4.	Tube Well Luttu-Kolinda	7.4	96.26	56	40.26	88.75	7.00	Nil	1.16	0
5	Hand pump Luttu-Kolinda	7.7	102.16	68	34.16	248.5	6.00	Nil	1.70	0
	Average	7.7	88.65	59.2	29.45	170.85	7.2	0.00	1.38	0.6

Source: Compiled by Authors

Table – V: Water quality parameter in randomly selected drinking water source of rural area nearby Jhunjhunu city (BAGGAR)

S. No.	Name of Water Source of Location	pH	TH mg/l	CaH mg/l	Mg-H mg/l	CI mg/l	No ₃ mg/l	Fe mg/l	EC ds/m	MPN /100ml for total coliform
1.	Water Reservoir Baggar	7.9	33.66	30	3.66	17.75	10.00	Nil	0.25	2

2.	Hand pump Baggar	7.7	141.68	88	53.68	301.75	7.00	Nil	1.48	0
3.	Tube Well Baggar	7.4	113.92	70	43.92	106.5	6.00	Nil	1.19	1
	Average	7.67	96.42	62.67	33.75	142	7.66	0.00	0.98	1

Source: Compiled by Authors

**Table – VI: Water quality parameter in randomly selected drinking water source of rural area nearby
Jhunjhunu city (Average)**

S.No.	Location	pH	TH mg/l	CaH mg/l	CT mg/l	No3 mg/l	Fe mg/l	EC ds/m	MPN /100ml for total coliform
1.	Bissau	7.78	93.11	62.00	168.63	7.25	0	1.48	0.50
2.	Mahensar	7.68	144.94	81.50	332.81	7.25	0	1.80	0.75
3.	Luttu – Kolinda	7.70	88.65	59.20	170.85	7.20	0	1.38	0.60
4.	Baggar	7.67	96.42	62.67	142.00	7.60	0	0.98	1.0

Source: Compiled by Authors