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Assessment of ground water quality of Khargone town (M.P.) and its impact on human health

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Abstract
The Earth is full of natural resource needed for the development of mankind. The ground water is not always suitable for drinking and other purpose. Generally the ground water is considered least polluted as compared to surface water. The turbidity, pH, Tds, specific conductivity, total alkalinity, hardness, chloride, fluoride, nitrate, sulphate, dissolved oxygen and bacteriological conditions were detected. A large population of Khargone Town is using ground water for drinking purpose. There for some of the water samples are not suitable for drinking purpose and they affected the health suitable for drinking purpose and they affected the health status also.

Keywords: faecal coliforms, physico-chemical, well, tube well, Hand pump, ground water

Introduction
Water plays an essential role in human life. Water is the most precious and important natural resources on the earth. Water is used for drinking, bathing and washing and many other purpose like irrigation and industries. Due to human activities this natural sources having fast depletion. Human and ecological use of ground water depends upon ambient water quality (Neelima bagde, 2016) [6].
Generally the ground water resources are considered least polluted as compared to the other natural resources. A large population of khargone town is using ground water for drinking purposes. The pollution of ground water system from organic and inorganic substances makes it unsafe for drinking (Dhakad and Cheudhary 2004) [3].
This study is to know the ground water quality and its suitability for drinking and domestic purposes at khargone town, M.P. for this object 6 ground water sampling station were monitored during 2007 seasonally.

Material and Methods
Study Area: Khargone town was selected for the present study.

Location: Khargone is district place of Madhya Pradesh. It is located in the western region of the state M. P.

Sampling Stations:
The 6 sampling stations were selected randomly in different areas of khargone town. Which cover all the direction of the town, these sampling stations are combination of 2 hand pump, 2 tube well and 2 open well. All the sampling stations were monitored seasonally. Detail of sampling stations is as under:-

a. **Hand Pumps:** (i) Nutan Nagar (ii) BTI Colony.
b. **Wells:** (i) Brijvihar Colony (ii) Krishi upaj mandi.
c. **Tube Wells:** (i) Gouridham (ii) Jyoti nagar.

Collection, Observation
Water sample from these stations were collected and testing was done as per the standard methods described by APHA (1992). The data was collected seasonally i.e- Rainy, winter and summer.

Table 1: Desirable limit of Drinking water of BIS

S. No.	Parameters	Standard limit
1	Colour	-
2	Turbidity	5 NTU
3	pH	6.5-8.8
4	Conductivity	-
5	TDS	500
6	Total Hardness	300
7	Total Alkalinity	120
8	Chloride	250
9	Fluoride	1.5
10	Nitrate	45
11	Sulphate	150
12	Total Coliforms	0 (Per 100 ml)
13	Faecal Coliforms	0 (Per 100 ml)

Result and Discussion
The result of physic-chemical characteristics of water is represented in table (2 to 4).
It is an established fact that maintenance of healthy aquatic system depends on physico-chemical properties of water and biological diversity. The colour of the hand pumps, tube wells and wells water was true in all three seasons.
The turbidity values of all hand pumps and tube wells water sample were under the desirable limit and well water turbidity was higher. Disposal of solid wastes near the wells was observed. Due to which water gets contaminated and the resulted in high turbidity value.
The pH values of all ground water samples were under the permissible limit of BIS. Some ground water sample of the

present finding show higher values of specific conductivity in summer season. This might be due evaporation and increase in dissolved contents. During rainy season dilution of water resulted in lower the specific conductivity values.

The TDS values of all ground water samples were higher during summer season. The necessary treatment of this ground water sample is a must for producing suitability for drinking purpose as for as TDS value or concerned.

The hardness values of all ground water samples were under the desirable limit according to WHO (1985). For drinking purpose hard water is always considered much better than the soft water. Hardness can slightly removed by boiling the water.

The chloride level of Nutan nagar hand pump was slightly higher than other ground water samples. It may be also due to chlorination treatment of water and disposed of refuse dump near this hand pump. Other ground water samples (well, tube-well and hand-pump) was results obtained under the maximum desirable limit. So, these type of water can be used for drinking and domestic purpose.

Table 2: Physic-chemical characteristics of water of Hand Pumps

S. No	Parameters	(i) Nutan Nagar			(ii) BTI Colony		
		Rainy	Winter	Summer	Rainy	Winter	Summer
1	Colour	T.C.	T.C.	Dried	T.C.	T.C.	Dried
2	Turbidity	1.2	2.8	Dried	1.9	1.28	Dried
3	pH	7.8	6.7	Dried	7.7	6.7	Dried
4	Conductivity	430	521	Dried	422	595	Dried
5	TDS	362	252	Dried	195	194	Dried
6	Total Hardness	291	312	Dried	236	294	Dried
7	Total Alkalinity	398	310	Dried	231	260	Dried
8	Chloride	202	220	Dried	139	146	Dried
9	Fluoride	0.04	0.03	Dried	0.01	0.01	Dried
10	Nitrate	26.0	22.0	Dried	22.0	17.0	Dried
11	Sulphate	18.0	16.0	Dried	31.0	27.0	Dried
12	Total Coliforms (Per 100 ml)	NIL	NIL	Dried	NIL	NIL	Dried
13	Faecal Coliforms (Per 100 ml)	NIL	NIL	Dried	NIL	NIL	Dried

T.C. = True Colour

Table 3: Physic-chemical characteristics of water of Wells

S. No	Parameters	(i) Brijvihar Colony			(ii) Krishiupaj Mandi		
		Rainy	Winter	Summer	Rainy	Winter	Summer
1	Colour	T.C.	T.C.	T.C.	T.C.	T.C.	T.C.
2	Turbidity	6.8	4.6	3.4	4.6	3.8	2.9
3	pH	7.6	7.1	6.7	7.8	7.2	6.7
4	Conductivity	360	570	409	361	472	486
5	TDS	353	381	282	299	292	311
6	Total Hardness	140	356	168	204	225	241
7	Total Alkalinity	192	335	218	196	211	230
8	Chloride	146	239	172	190	202	208
9	Fluoride	NIL	NIL	NIL	NIL	NIL	NIL
10	Nitrate	19.2	20.2	23.9	17.0	21.0	24.0
11	Sulphate	58.0	49.0	32.0	42.0	36.0	29.0
12	Total Coliforms (Per 100 ml)	NIL	NIL	NIL	NIL	NIL	NIL
13	Faecal Coliforms (Per 100 ml)	NIL	NIL	NIL	NIL	NIL	NIL

T.C. = True Colour

Table 4: Physic-chemical characteristics of water of Tube Wells

S. No	Parameters	(i) Gouridham			(ii) Jyotinagar		
		Rainy	Winter	Summer	Rainy	Winter	Summer
1	Colour	T.C.	T.C.	T.C.	T.C.	T.C.	T.C.
2	Turbidity	1.6	1.11	1.2	1.8	1.12	Dried
3	pH	7.8	7.0	6.5	7.8	7.0	Dried
4	Conductivity	500	573	688	646	788	Dried
5	TDS	347	378	380	418	378	Dried
6	Total Hardness	310	348	388	199	176	Dried
7	Total Alkalinity	106	125	177	209	225	Dried
8	Chloride	218	232	254	128	182	Dried
9	Fluoride	NIL	NIL	NIL	0.02	0.01	Dried
10	Nitrate	21.2	19.4	18.7	13.8	12.2	Dried
11	Sulphate	62.0	56.0	43.0	60.0	52.0	Dried
12	Total Coliforms (Per 100 ml)	NIL	NIL	Dried	NIL	NIL	Dried
13	Faecal Coliforms (Per 100ml)	NIL	NIL	Dried	NIL	NIL	Dried

T.C. = True Colour

Fluoride content of all the ground water samples of present study was under the desirable limit of BIS. It is in agreement with the study of Dhakad and choudhary (2004) [3]. If it cross the limit (1.5gm/l.) of BIS may cause fluorosis diseases.
Nitrate and sulphate content of all the ground water samples of resent study was under the maximum desirable limit of BIS. It's safe for drinking and domestic purpose. If nitrate found above 45 mg may cause methemoglobinemia. Nitrate which may be due to large addition of decayed vegetable and animal matter, sewage sludge, domestic effluients disposal to land leachates from refuse dump and atmospheric washout. Similar findings were recorded by Ravinder *et al.* (2005) [7].
Total coliforms and Faecal coliforms were not found in the all ground water samples.

Suitability of the Ground Water Samples

1. Well water samples having highest values of some parameters. It is suggested that these water cannot be used for drinking and domestic purpose they can create health problems.
2. The present study indicate the higher values of some parameters in most of this sample. Which is not suitable for drinking but, after the treatment including coagulation, sedimentation, filtration and remove naturally present impurities and its suitability for drinking and domestic purpose.
3. Higher contaminated water is create the various water related and water born diseases. Known as diarrheas, cholere, gastroenteritis and other diseases.
4. All ground water samples are suitable for irrigation, bathing and washing.

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