Introduction

Water is one of the most essential needs for the continued existence of all living organisms on earth. The day-to-day activities of all living organisms require water in some form. It is effectively and efficiently put into use by plants, Animals, microorganisms and man. In the microbial world, no single microorganism has been discovered to be active at the extreme lack of water for the singular reason that man cannot exist without water, it is of paramount importance to monitor domestic water supply. (Sofola and Lawal 1983)

Municipal wastewaters can introduce bacteria, viruses, organic and inorganic compounds in ground water. Sewage and garbage are the main source of pollution in city. In India a total of 12,145 million litres of wastewater is generated per day in class one cities covering 65 % of Indian population, out of which only 2633 million litres (22%) collected through sewage system and rest is directly discharged to land of water without treatment (Mishra et al., 1995).

Water plays an essential role in human life. Although statistics vary, as the World Health Organization (WHO) reports that approximately 36% of urban and 65% of rural Indian’s were without access to safe drinking water.(WHO,2009)

Pollutants released to surface change the quality of ground water. Polluted surface water bodies that contribute to ground water recharge become source of its pollution However. Leakage of sewage into ground water is a common occurrence especially from old sewers, leakage result from poor workmanship, defective sewer pipes, and sewer leakages introduce high concentration of Nitrate, organic chemicals and Micro organisms.

The groundwater quality is a function of natural processes as well as anthropogenic activities. The safe potable water is enormously essential for living and groundwater is one of the sources for human consumption in both urban as
well as rural areas. In India almost 80 percent of the rural population depends on untreated groundwater for potable water supplies (Sudhakar and Mamatha, 2004).

*Vibrio cholera* is the causative agent of cholera which is potentially a fetal diarrheal disease. Cytrobacter freundii is often confused with Escherichia and salmonella, however it is hydrogen sulphide positive unlike Escherichia and lacks the pathogenicity of salmonella. (Townsend, 1992). In Western Australia 30% of all salmonella is isolation from water have occurred in the absence of indicator bacteria. (Peterson and Schorsch, 1980).

In many developing countries, availability of water has become a critical and urgent problem and it is a matter of great concern to families and communities depending on non-public water supply system (Okonko, et al., 2008). The most dangerous form of water pollution occurs when faecal contaminant like *E. coli* enter the water supply. Contaminants ingested into water supply cause many diseases. Examples of such pathogens are *Salmonella species*, *Shigella species*, *Vibrio cholerae* and *E. coli*.

Water is an indispensable natural resource on earth. Safe drinking water is the primary need of every human being. Fresh water has become a scarce commodity due to over exploitation and pollution of water. Groundwater is the major source of drinking water in both urban and rural areas (Gupta et al., 2009).

Water emerges from shallow ground water and is abstracted from bore well, hand pump and well, types of impurities, kinds of bacteria depend on nature of catchments, so bacterial quality is always variable, these bacteria may cause harm to human beings.

A bacterial activity in ground water depends on nature of water along with its substances and environment. Physico-chemical conditions, micro organisms and their relationship with human life are of greater importance.

**Materials and methods**

The Drinking water sample collected from the different sources like Tap water, tube well and hand pump. A total of 50 drinking water samples were collected for bacteriological quality analysis from Dhar city and their adjacent
villages namely Delmi, Badpipli, Sitapat, Padliya, Matalabpura, Khilchipura, Tornod, Jetpura and Utawad.

In the adjacent villages of Dhar city hand pumps water samples were collected. The microbiological quality of drinking water samples was tested by the field test method designed by Manja et al., (1982). This method is based on the detection of hydrogen sulphide producing organism in water by the use of hydrogen sulphide strips. The drinking water sample was taken and directly added into the H$_2$S medium contain bottle up to the arrow mark. These bottles were then incubated at room temperature (35-37°C) for 24, 48 and 72 hours. After incubation medium colour remains yellowish brown with no haziness and no blackening, water was fit for drinking purpose. If medium colour changes to black/ yellowish brown with haze, water was unfit for drinking purpose.

After than those samples were recorded unfit or not potable for drinking purpose that sample tested by water testing H$_2$S kit for identifying cholera and typhoid species. If medium show purple white Black precipitate with turbidity of medium indicates presence of *salmonella typhi* that causes typhoid. If medium show dark burgundy medium indicates presence of vibrio species that causes cholera.

**Results and discussion**

In the present study, a total of 50 drinking water samples were collected to examine Microbiological quality. The samples have been collected different drinking water sources tape water, boring water and hand pump in Dhar city and their adjacent villages.

The present investigation was based on bacteriological study for drinking water quality of Dhar city. The study has been done seasonally.

In rainy season only 85% of drinking water samples were fit for drinking purpose and only 15% of drinking water samples were unfit for drinking purpose.

In winter season only 85% of drinking water samples were fit for drinking purpose and 15% of drinking water samples were unfit for drinking purpose.
In summer season 65 per cent of drinking water samples were fit for drinking purpose and only 35 per cent of drinking water samples were unfit for drinking purpose in Dhar city.

In Dhar city tube well water is the main source of drinking water (48%). Hand pump is the second source for drinking purpose (32.5%). Tap water (17.5) and well water which is limited source of drinking water which was only 2.5 per cent in the study areas.

In the present study, during rainy season 95% and 5% of tube well water, 85% and 15% Hand pump water samples were fit and unfit for drinking purpose respectively and 71% and 29% of tap water samples were fit and unfit for drinking purpose respectively.

In winter season 95% and 5% of tube well water, 77% and 23% Hand pump water samples were fit and unfit for drinking purpose respectively and 86% and 14% of tap water samples were fit and unfit for drinking purpose respectively.

In summer season 74% and 26% of tube well water, 77% and 23% Hand pump water samples were fit and unfit for drinking purpose respectively and 14% and 86% of tap water samples were fit and unfit for drinking purpose respectively.

In Dhar city one well is reported their water is unfit for drinking purpose in rainy and winter seasons and also become dry in summer season. Kaushik et al.,(1963) reported than 93% of drinking water in Delhi was unfit for drinking purpose. Narayan and Rao (1981) also reported 100% well water to be bacteriologically unfit for human consumption in Warangal town.

In the adjacent villages of Dhar city hand pump is only the main source of drinking water. adjacent villages namely Delmi, Badpipli, Sitapat, Padliya, Matalabpura, Khilchipura, Tornod, Jetpura and Utawad. In rainy season only 90% of drinking water samples were fit for drinking purpose and only 10% of drinking water samples were unfit for drinking purpose.

In winter season only 70% of drinking water samples were fit for drinking purpose and 30% of drinking water samples were unfit for drinking purpose.
Sharma et al., (1995) reported that above 65% of ground water sample to be microbiological unfit for drinking purpose.

In summer season all water samples were found to be fit for drinking purpose in adjacent villages of Dhar city.

In the study areas the Tap water also as a drinking water source which was found to be contaminated 86% in summer season in Dhar city and 30% of Hand pump water source found to be contaminated in winter season in adjacent villages of Dhar city. Water source is mostly contaminated due to either its location near the sewage line or waste water which stand around the source. Seepage from sewage line also contributes to bacterial contamination. At many places the pipe line of municipal tap water supply crossed the sewage water which causes water borne diseases, such as diarrhoea, cholera, jaundice, typhoid and dysentery.

**Microbiological study of water by WHO water testing kit (cholera, typhoid)**-

In the present study those samples were found unfit for drinking purpose after examine of Microbiological study during rainy winter and summer season respectively. That sample has been tested by WHO water testing kit (cholera, typhoid). The samples have been collected from unfit drinking water sources namely tape water, boring water hand pump and well in Dhar city. Whereas unfit samples were collected from hand pumps of adjacent villages of Dhar during rainy and winter season. All samples were found fit for drinking purpose during summer season.

In Dhar city in rainy season 33.33% of *salmonella typhi*, 16.67% *vibrio* cholerae and 50% other species were observed of drinking water samples were unfit for drinking purpose.

In winter season 50% *salmonella typhi*, 33.33% vibrio species and 16.67% other species was found in drinking water samples. The samples were unfit for drinking purpose.

In summer season 35.71% *salmonella typhi*, 21.42% *vibrio* cholerae and 42.85% other species were recorded in drinking water samples. Water was unfit for drinking purpose.
In the adjacent villages of Dhar city only one hand pump water source is found unfit in rainy season that sample presence of *salmonella typhi* and three hand pumps water source unfit in winter season that show the presence of 66.67% *salmonella species* and 33.33 % *vibrio cholerae*. In summer season all of the samples were found fit for drinking purpose. Tambekar and Neware (2012) reported that 30% of tube well in villages of Amravati district was unfit for drinking purpose. Rajgire (2013) reported that 37% of tube well water in Nirmal Gram Puraskar awarded villages; Amravati district was unfit for drinking purpose.
Bacteriological Study

Bacteriological quality of Tube well in Dhar city

<table>
<thead>
<tr>
<th>Season</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainy</td>
<td>5.00%</td>
</tr>
<tr>
<td>Winter</td>
<td>5.00%</td>
</tr>
<tr>
<td>Summer</td>
<td>26.00%</td>
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</tbody>
</table>

Unfit for Drinking purpose

Bacteriological quality of Hand pump in Dhar city

<table>
<thead>
<tr>
<th>Season</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainy</td>
<td>15.00%</td>
</tr>
<tr>
<td>Winter</td>
<td>23.00%</td>
</tr>
<tr>
<td>Summer</td>
<td>23.00%</td>
</tr>
</tbody>
</table>
Bacteriological Study

Bacteriological quality of drinking water in Dhar city

- Rainy: 15.00%
- Winter: 15.00%
- Summer: 35.00%

Unfit for drinking purpose

Bacteriological quality of drinking water Hand pump in adjacent villages of Dhar city

- 30.00%
Microbial study of (cholera, typhoid) drinking water in rainy season in Dhar city
Microbial study of (cholera, typhoid) drinking water in winter season in Dhar city

- salmonella typhi: 50.00%
- vibrio cholerae: 33.33%
- other: 16.67%
Microbial study of (cholera, typhoid) drinking water in winter season in adjacent villages of Dhar city

- Salmonella typhi: 66.67%
- Vibrio cholerae: 33.33%
- Other: 0%

Microbial study of (cholera, typhoid) drinking water in summer season in Dhar city

- Salmonella typhi: 35.71%
- Vibrio cholerae: 21.42%
- Other: 42.85%