A QUALITATIVE STUDY ON THE SURFACE WATER BODIES FOR POTABLE PURPOSE FROM THE MUNICIPAL CORPORATION REGION OF SHIMLA (H. P.)

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In the Himalayan terrain, surface water is used for drinking, irrigation and industrial purposes because of perennial rivers/springs flowing due to melting of glaciers. The flowing water in upstream areas is good except any natural mixing of materials. But, in downstream areas, the anthropogenic activities have deteriorated the water quality. Many workers have done good work on water quality in different types of terrains and land use¹-⁸.

Shimla the capital of Himachal Pradesh is situated between the 30° 45’ N to 31° 44’ N latitudes and 77° 0’ E to 78° 19’ E longitudes. Total area of Shimla Municipal Corporation is 27.38 sq. km. The municipal corporation is divided in to 25 municipal zones.

MATERIALS AND METHODS

Survey of India Toposheets was used for base map preparation and 11 water samples have been collected from surface water bodies in the month of June 2013 (Fig.1). GPS was used to locate the geo-coordinates of the sample locations. All the 11 water samples were analyzed from Himachal Pradesh Irrigation and Public Health Department, Water Testing Laboratory, Dhalli, Shimla. The results of the sample analysis are given in Table-1.

In the present study, 11 water samples were collected from surface water bodies in the month of June, 2013. All the samples have been analyzed at Himachal Pradesh Irrigation and Public Health Department, Water Testing Laboratory, Dhalli, Shimla. Parameters like pH, total alkalinity, chloride, nitrate, hardness, iron, fluoride, TDS are under desirable limit at all the eleven locations. Coliform is also under desirable limit in all water bodies except Ashwini Khad. At Ashwini Khad coliform are 16 MPN while in Churat Nala and Giri Khad, coliform are 9 MPN near to non-potable i.e. 10 MPN. The study is highly useful for understanding the surface water bodies quality. The locations where quality is not good or deteriorated due to anthropogenic activities suitable remedial measures should be taken and water sample analysis should be done at regular intervals for monitoring the health hazard parameters like coliform.

RESULTS AND DISCUSSION

1. Ashwin Khad: The water sample analysis result of raw water of Ashwini Khad shows that pH 8, total alkalinity 60 mg/l, chloride 40 mg/l, nitrate 10 mg/l, hardness 136 mg/l, iron nil, fluoride nil, TDS 217 mg/l and coliform 16 MPN. The water quality at this location is deteriorated due to the presence of coliform bacteria. (Fig.2 to Fig. 10 and Table -1).

2. Ashwini Khad: The water sample analysis result of raw water after sedimentation shows that pH 8.1, total alkalinity 50 mg/l, chloride 37.5 mg/l, nitrate 8 mg/l, hardness 74 mg/l, iron nil, fluoride nil, residual chlorine 0.2 mg/l, TDS 175 mg/l and coliform 0 MPN (Fig.2 to Fig. 10 and Table-1).

3. Kasumpati: The sample was taken from Kasumpati tank after chlorination. The sample analysis result shows that the pH 8, total alkalinity 40 mg/l, chloride 37.5 mg/l, nitrate 8 mg/l, hardness 84 mg/l, iron nil, fluoride nil, residual chlorine 0.2 mg/l, TDS 168 mg/l, and coliform 0 MPN (Fig.2 to Fig. 10 and Table-1).

4. Sanjauli: The result of water sample analysis of public tap water at Sanjauli shows that pH 8.2, total alkalinity 40 mg/l, chloride 20 mg/l, nitrate nil, hardness 52 mg/l, iron nil, fluoride nil, residual chlorine 0.2 mg/l, TDS 182 mg/l and coliform 0 MPN. (Fig.2 to Fig. 10 and Table-1).
Table 1. Showing Physico-chemical variation at different locations

<table>
<thead>
<tr>
<th>S. No</th>
<th>Location</th>
<th>Source</th>
<th>pH</th>
<th>Total Alkalinity (mg/l)</th>
<th>Chloride (mg/l)</th>
<th>Nitrate (mg/l)</th>
<th>Total Hardness (mg/l)</th>
<th>Iron (mg/l)</th>
<th>Fluoride (mg/l)</th>
<th>Total Dissolved Solids (mg/l)</th>
<th>Coliform (MPN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ashwin Khad</td>
<td>Water Body</td>
<td>8</td>
<td>60</td>
<td>40</td>
<td>10</td>
<td>136</td>
<td>0</td>
<td>1.5</td>
<td>217</td>
<td>16</td>
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<td>2.</td>
<td>Ashwini Khad</td>
<td>Water Body</td>
<td>8.1</td>
<td>50</td>
<td>37.5</td>
<td>8</td>
<td>74</td>
<td>0</td>
<td>0</td>
<td>175</td>
<td>0</td>
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<td>3.</td>
<td>Kasumpati Tank</td>
<td>Tank</td>
<td>8</td>
<td>40</td>
<td>37.5</td>
<td>8</td>
<td>84</td>
<td>0</td>
<td>0</td>
<td>168</td>
<td>0</td>
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<tr>
<td>4.</td>
<td>Sanjauli</td>
<td>Tap</td>
<td>8.2</td>
<td>40</td>
<td>20</td>
<td>0</td>
<td>92</td>
<td>0</td>
<td>0</td>
<td>182</td>
<td>0</td>
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<td>5.</td>
<td>Churat Nala</td>
<td>Water Body</td>
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<td>35</td>
<td>15</td>
<td>0</td>
<td>134</td>
<td>0</td>
<td>0</td>
<td>175</td>
<td>9</td>
</tr>
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<td>6.</td>
<td>Gumma</td>
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<td>7.8</td>
<td>40</td>
<td>37.5</td>
<td>0</td>
<td>186</td>
<td>0</td>
<td>0</td>
<td>203</td>
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<tr>
<td>7.</td>
<td>Chair Nala</td>
<td>Water Body</td>
<td>7.3</td>
<td>15</td>
<td>12.5</td>
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<td>96</td>
<td>0</td>
<td>0</td>
<td>147</td>
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<tr>
<td>8.</td>
<td>Giri Khad</td>
<td>Water Body</td>
<td>7.5</td>
<td>25</td>
<td>12.5</td>
<td>0</td>
<td>164</td>
<td>0</td>
<td>0</td>
<td>182</td>
<td>9</td>
</tr>
<tr>
<td>9.</td>
<td>Tutu</td>
<td>Tap</td>
<td>7.6</td>
<td>35</td>
<td>12.5</td>
<td>0</td>
<td>184</td>
<td>0</td>
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<td>Tap</td>
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<td>40</td>
<td>15</td>
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<td>146</td>
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<td>0</td>
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</table>

Fig. 1. Sample location map

Fig. 2. pH at different locations
Fig. 3. Total alkalinity at different locations
Fig. 4. Chloride at different locations
Fig. 5. Nitrate at different locations
Fig. 6. Total hardness at different locations
Fig. 7. Fluoride at different locations
Fig. 8. Total dissolved solids at different locations
Fig. 9. Iron at different locations
Fig. 10. Coliform at different locations
5. **Churat**: The water sample analysis result of raw water of ChuratNala shows that pH 7.7, total alkalinity 35 mg/l, chloride 15 mg/l, nitrate nil, hardness 134 mg/l, iron nil, fluoride nil, TDS 175 mg/l and coliform 9 MPN (Fig.2 to Fig. 10 and Table-1).

6. **Gumma**: The water sample analysis result of raw water taken from Gumma shows that pH 7.8, total alkalinity 40 mg/l, chloride 37.5 mg/l, nitrate nil, hardness 186 mg/l, iron nil, fluoride nil, TDS 203 mg/l and coliform 2 MPN (Fig.2 to Fig. 10 and Table-1).

7. **Chair**: The sample was taken from raw water of Chair Nala. The sample analysis result shows that pH 7.3, total alkalinity 15 mg/l, chloride 12.5 mg/l, nitrate nil, hardness 96 mg/l, iron nil, fluoride nil, TDS 147 mg/l and coliform 2 MPN (Fig.2 to Fig. 10 and Table-1).

8. **Giri Khad**: The sample was taken from raw water of Giri Khad. The sample analysis result shows that pH 7.5, total alkalinity 25 mg/l, chloride 12.5 mg/l, nitrate nil, hardness 164 mg/l, iron nil, fluoride nil, TDS 182 mg/l and coliform 9 MPN (Fig.2 to Fig. 10 and Table-1).

9. **Tutu**: The sample was taken from public tap at Tutu. The sample analysis result shows that pH 7.6, total alkalinity 35 mg/l, chloride 12.5 mg/l, nitrate nil, hardness 184 mg/l, iron nil, fluoride nil, TDS 189 mg/l and coliform 0 MPN (Fig.2 to Fig. 10 and Table-1).

10. **Boileuganj**: The water analysis result of sample taken from public tap at Boileuganj shows that pH 7.8, total alkalinity 45 mg/l, chloride 15 mg/l, nitrate nil, hardness 176 mg/l, iron nil, fluoride nil, TDS 189 mg/l and coliform 0 MPN (Fig. 2 to Fig. 10 and Table-1).

11. **Dhalli**: The sample was taken from public tap at Dhalli. The sample analysis result shows that pH is observed 7.8, total alkalinity 40 mg/l, chloride 15 mg/l, nitrate nil, hardness 146 mg/l, iron nil, fluoride nil, TDS 182 mg/l and coliform 0 MPN (Fig.2 to Fig. 10 and Table-1).

The study shows that quality of surface water bodies is good at all the locations except AshwiniKhad where the coliform bacteria have been observed 16 MPN. The ChuratNala and GiriKhad water bodies have coliform bacteria 9 MPN which are very close to non-potable limit i.e. 10 MPN. Therefore, there is need to monitor the pollution sources and take remedial measures.

**REFERENCES**