We understand that we can not stay on earth without water, because water is essential elements of life. Water is in fact a vehicle for the transfer of a wide range of diseases of microbial origin. Patna is the first largest city of Bihar and it is also a capital of Bihar. Most resident of the city are served with water through a piped water supply system. The important bacterial diseases include typhoid fever, cholera, and bacterial dysentery that are generally transmitted when human faces from carriers or patients contaminate the water. For pathogens transmitted by the faecal-oral route, drinking-water is only one vehicle of transmission. Nearly half of the population of developing countries suffers from health problems due to lack of drinking water or bacterial contaminate water. The World Health Organization estimated that up to 80% of ill health in developing countries is water and sanitation related. WHO estimated 4 billion cases of diarrhoea annually represented 5.7% of the global disease burden in the year 2000. Faecal pollution of drinking water may introduce various forms of intestinal pathogens which may cause mild diseases like mild gastroenteritis to severe and sometimes fatal dysentery, diarrhoea, cholera, typhoid and hepatitis A etc. The improper management of water systems may cause serious problems in availability and quality of water. Ideally, drinking water should not contain any microorganisms known to be pathogenic or any bacteria indicative of faecal pollution. Detection of faecal indicator bacteria in drinking water provides a very sensitive method of quality assessment and it is not possible to examine water for every possible pathogen that might be present. Level of sanitary conditions in the community appears to have inverse relationship with the contamination of water supplies. Water in distribution becomes contaminated during its passage in water pipes. This contamination can occur due to defective joints, back siphonage, rusted pipelines crossing over the sewage pipes and low/ high pressure in the pipelines. The origin of Escherichia coli is almost exclusively of fecal origin, thus if it is found in water or food, it indicates fecal contamination and an imminent health danger, as other fecal pathogens such as viruses or parasites may be also present. The majority of test for bacteria depend on using three indicator bacterial types. They are the total coliform group, the fecal coliform group, and E. coli.

**MATERIALS AND METHODS**

In the present study, water sample from piped water supply of Patna town were tested during the months of May and June 2011. A total of 156 water samples were collected and tested...
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Samples were collected from different socio-economic conditions. Samples were collected from high socio-economic condition 21, and intermediate socio-economic condition 50, and low socio-economic condition 85. The localities of high socio-economic condition were (Patliputra colony, Boring road, Bely road, Chajoo Bagh, Exhibition road, Frazer road). Intermediate socio-economic condition were (Raja pool, Raja Bazar, Sabzi Bagh, Machoa toil, Govind Mitra road, Murad pur, Khajanchi road, Rajender nagar). Low socio-economic condition were (Mitha pur, Alam gang, Sultan ganj, Shah ganj, Gaya ghat, Pachim darwaza, Kaje kalan, Agam kuan, Guzar bagh, Naye sarak, Noon ka choraha, Mangal talab, Fasat ka maidan, Near Patna sahib station). The socio-economic conditions was based on housing condition, drinking water facility, sanitation, education, income, occupation. Water samples were collected in 200 ml capacity sterilized containers from the household water taps using standard water collection techniques. After collection of samples were transported to microbiology laboratory within two hours of collection. In the present study the Most Probable Number (MPN) technique was used for the water analysis. The procedure for the MPN method for total coliform and faecal coliform in which three dilutions (50 ml, 10 ml, and 1 ml) of each sample were used was adapted from 10. All the samples were analyzed by Multiple Tube Test for determination of most probable number (MPN) of coliforms and faecal coliforms. All the water samples were considered as having doubtful quality. All water samples were previously labeled with code number, mix thoroughly the sample of water by inverting the bottle several times before inoculation. Aseptically 50 ml of water sample was added to tube containing 50 ml of sterile double strength MacConkey broth medium, by the use of sterile pipette 1 ml of water sample was added to each of the five tubes containing 10 ml of sterile double strength MacConkey broth medium. Additionally by the use of pipette 1 ml of water sample was added to each of five tubes containing 5 ml of sterile single strength MacConkey broth medium. All the tubes of broth contained an inverted sterilized Durham tube for the collection of gas, this was added at the time of sterilization of broth. All the inoculated broths were incubated at 37°C for 24-48 hours. After incubation the tube consider positive for coliforms, which showed acid and gas production. For all positive tubes Most probable number of Total coliforms was determined by referring to standard probability tables for estimation of Total coliforms. All the positive tubes for Total coliforms were sub cultured into 10 ml of sterile single strength MacConkey broth medium with inverted Durham tubes and 5 ml of sterile peptone water for conformation of faecal coliforms whether it is present or not. After all these tubes were incubated at 44°C for 24 hours. Tubes with acid and gas and indol production were consider as positive for faecal coliforms (Eijkman test positive). By the number of these positive tubes, MPN of faecal coliform was calculated by referring to the table as for Total coliforms. One or more MPN of the samples were considered contaminated while zero MPN of the samples were considered free from bacterial contamination, according to WHO standard for treated water in the distribution system. Table 1.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Units</th>
<th>WHO Guidelines value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total coliform</td>
<td>MPN/100 ml</td>
<td>0</td>
</tr>
<tr>
<td>Faecal coliform</td>
<td>MPN/100 ml</td>
<td>0</td>
</tr>
<tr>
<td>E.coli</td>
<td>MPN/100 ml</td>
<td>0</td>
</tr>
</tbody>
</table>
RESULTS AND DISCUSSION

In this study it was evaluated of bacteriological quality of drinking water from different socio-economic conditions of Patna town. According to WHO standard for treated water in the distribution system, coliform bacteria must not be detectable in any 100 ml sample. In the present study evaluation of bacteriological quality of drinking water samples from different socio-economic condition were not satisfactory at all. The results of bacteriological contamination of water samples among different socio-economic conditions of Patna town are given on Table 2 and Fig. 1. In the present study 67 (42.9%) water samples were positive for bacterial contamination out of 156 water samples and made it unfit for human consumption. The results from present study were indicated that low socio-economic condition water samples were more affected from bacterial contamination (50.5%), followed by (42%) in intermediate socio-economic condition and (14.2%) in area with high socio-economic condition. There was significant difference between area with low socio-economic condition and high socio-economic condition and non significant difference between area with low socio-economic condition and intermediate socio-economic condition.

A similar percentage of bacterial contamination has been obtained 38% from\textsuperscript{12}, the heading was Drink at your own risk, Patna, March 31: Water supplied by the Patna Municipal Corporation (PMC) is not the healthiest drink in the state capital. All the samples were tested in department of environment and management Patna and gave the reason for bacterial contamination are due to ineffective treatment or contamination in the distribution system, the water supply pipelines and the sewage pipelines are parallel and close to each other, the water supply pipelines are very old and ruptured at places, so there is possibility of bacterial contamination by sewage pipelines. But a different percentage of bacterial contamination has been reported 30% from\textsuperscript{13}, the heading was 60% Patnaites drink impure water, PATNA: About 60 per cent of the households in Patna drinks contaminated water. Samples were collected and tested by Patna Water Board (PWB) and gave reason for bacterial contamination are due to water pipes are very old, there are many leakages and cracks in them.

The present study was done in the year 2011 and the bacterial contamination of the samples were 42.9%, this percentage of bacterial contamination of samples is much higher than the percentage of PWB 30% were done in the year 2006. Difference of these percentages indicate that, percentage of bacterial contamination is in increasing order since 2006 to up till now. It means that there is deterioration in Patna water supply system.

It was also observed that bacterial contamination was less in high socio-economic condition and more in low socio-economic condition, this difference was due to the level of sanitary conditions of high socio-economic condition was better than low socio-economic condition. The evidence suggests that interventions targeted at poor populations provide significant health benefits and contribute to poverty alleviation\textsuperscript{14}. In the present study at the time of collection of samples, also evaluated water supply pipelines conditions. In low socio-economic condition was found that, water supply pipes were very old, ruptured at places, many leakages, and water supply pipelines and sewage pipelines were parallel and very close to each other. Specially in the street water supply pipelines and open sewage lines were parallel and very close to each other, sanitary conditions was also not good. But in high socio-economic condition some leakages were found, and the condition of water supply pipelines, sewage pipelines, sanitary conditions were better than low socio-economic condition, though not satisfactory at all.

These are the factors of contamination occurred during the course of distribution through leaky pipes. This contamination can occur due to defective joints, back siphonage, rusted pipelines crossing over the sewage pipes and low/ high pressure in the pipelines\textsuperscript{9}. All this data indicates that bacteriological contamination of drinking water is a significant problem. Water supply surveillance programmes should identify those interventions that will result in improvements in water supply that will be protective of public health\textsuperscript{4,15,16}.

Bacteriological contamination of drinking water in other parts of India is also not good. In Hyderabad 40% of the samples from piped water supply were polluted\textsuperscript{17}, this percentages are similar as present study 42.9%. In Maharashtra 45.9% of the samples from piped water supply were polluted\textsuperscript{18}. Bacteriological contamination of water supply in other countries are also not good. In Pakistan contamination of tape water samples were 87\%\textsuperscript{19}. In Bangladesh contamination of tape water samples were 71.43\%\textsuperscript{20}. Bacteriological pollution of
drinking water samples in Nepal were 82.4%\textsuperscript{21}. In Ethiopia contamination of tape water samples were 57%\textsuperscript{22}. All the results of bacteriological quality of drinking water indicates that bacterial contamination of drinking water is a significant problem.

CONCLUSION

Bacteriological quality of drinking water of deferent socio-economic conditions were not fit for human consumption. Specially population with low socio-economic condition were greatly affected by bacterial contamination of drinking water. There was significant difference between area with low socio-economic condition and high socio-economic condition. Faecal pollution of drinking water may introduce various forms of intestinal pathogens which may cause mild diseases like mild gastroenteritis to severe and sometimes fatal dysentery, diarrhoea, cholera, typhoid and hepatitis A etc\textsuperscript{6}. So it is necessary to prevent the bacterial contamination of drinking water supply. For preventions these are the important points: Proper sanitary survey, regular disinfections, maintenances and supervisions (Control of piping network and repairing whenever necessary) of drinking water supply and regular bacteriological analysis of samples of different localities. Safeguard against water born infection and suggests to public boil the water before use.

Table 2. Bacteriological contamination of water samples among different socio-economic conditions of Patna town.

<table>
<thead>
<tr>
<th>Socio-economic Conditions(SEC)</th>
<th>No of samples</th>
<th>Bacterial contamination</th>
<th>Present</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>High SEC</td>
<td>21</td>
<td>3</td>
<td>14.2</td>
<td></td>
</tr>
<tr>
<td>Intermediate SEC</td>
<td>50</td>
<td>21</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Low SEC</td>
<td>85</td>
<td>43</td>
<td>50.5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>156</td>
<td>67</td>
<td>42.9</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1. Bacteriological contamination of water samples among different socio-economic conditions of Patna town.


12. The Telegraph - Calcutta (Kolkata), Bihar Drink at your own risk. Friday, April 1, 2011, PIYUSH KUMAR TRIPATHI


