# DEULGAON RAJA CITY, MAHARASHTRA STATE, INDIA: BACTERIOLOGICAL ASSESSMENT OF WELL AND RIVER WATER

**Mr. Devanand. H. Dongre,**Assistant Professor, Samarth College of pharmacy Deulgaon raja.

**Mr. Nivrutti D. Pandit,**Assistant Professor, Samarth College of pharmacy Deulgaon raja.

**Mr. Tanmay S Dongaonkar,**Associate Professor, Samarth College of pharmacy Deulgaon raja.

**Mr. Om S Kharde,** Assistant Professor, Samarth College of pharmacy Deulgaon raja.

**Mr. Sunil. V. Kolhe,**Lecturer, Samarth College of pharmacy Deulgaon raja.

**Mr. Pawan S. Narkhede,**Associate Professor, Samarth College of pharmacy Deulgaon raja.

**Dr. Prafulla R Tathe,**Principal & Professor, Samarth College of pharmacy Deulgaon raja.

**Corresponding author: Mr. Devanand. H. Dongre,** Assistant Professor, Samarth College of pharmacy Deulgaon raja. Email id: devanandhd@gmail.com

**Abstract**

**Purpose:**This research work is aimed at investigating the microbiological safety of wells and river water in Deulgaon raja city, Maharashtra state, India so as to avoidaplague of aquatic diseases.

**Materials and Methods:**Water samples from river and well water from different populations in Deulgaon raja city were randomly collected and bacteriological analysis was carried out on them using standard microbiological methods.

**Result:**The results showed that the least microbial loads value of $0.70 \times 10^3$cfu/ml was obtained from river water while well water had the highest microbial load with a count of $1.10 \times 10^3$ cfu/ml. Well water, however, had the highest total coliform (392 MPN/100mL) and lowest coliform count from river with (22MPN/100mL). The isolates identification includes, *Alcaligensspp, Yesinia enterocolitica, Lactobacillus spp, Salmonella spp, Enterobacter spp, Streptococcus spp and Escherichia coli.*

**Conclusion:**These sources' analyzed water is used for drinking, cooking, washing dishes, and bathing. Due to the presence of harmful microorganisms, there is a higher risk of contracting water-borne illnesses including diarrhoea and salmonellosis, among others, because runoff and sewage from open defecation are closer to the water source.

**Introduction:** They are not eliminated in the faeces. strain of Escherichia coli can be lethal if present in drinking water. Both freshwater and saltwater contain a variety of microorganisms naturally (WHO, 1996). Due to potential effects on public health, the microbiological quality

of drinking water has garnered significant attention globally (Amira*et al*, 2011). Since many years ago, total and faecal coliform have been widely employed as markers to assess the hygienic quality of water supplies. The most evident symptom of a waterborne disease is an epidemic. Numerous tasks are performed by microbiological analyses as part of the investigation of waterborne epidemics. Water is one of the most prevalent compounds and a suitable solvent for a variety of substances; it exists at ambient temperature as a transparent, flavourless liquid that freezes into It is necessary for life on earth to have ice at 0 °C and boiling water at 1000 °C (Amira*et al*, 2011).

In 1967, the World Health Organisation (WHO) ranked water as the second most essential need for all living beings, right behind air. In fact, some scientists think that water is where life first started. There are two main categories of water, including:

**Surface Water:** They include the streams, lakes, and shallow wells. The air through which the rain passes may contaminate the water.

**Ground Water:** They originate from deep well and subterraneous springs. This is virtually free of bacteria due to filtering action of soil deep sand and rock. However, it may become contaminated when it flows along the channels. Poor hygiene behaviors and inadequate sanitation in public places including hospitals, health centers and schools providing access to sufficient quantities of safe water (Ogwegbu and Muhanga, 2005). The provision of facilities for sanitary disposal of excreta and introducing sound hygiene behaviors, are of capital importance to reduce the burden of disease caused by these risk factors. The most common manifestation and cause of mortality in water borne diseases were as result of dehydration due to loss of copious amounts of electrolytes either in vomiting or diarrhea (Ferner, 2001).

Pathogenic microorganisms and heavy metal contamination is a very harmful case in water as it an alarming case worldwide due to human activities and advance in technology which brings about health implication. There is an adverse effect associated with water contamination with pathogenic organisms such as *Escherichia coli, Salmonella spp*, Vibrio cholera and more. These effects can be outbreaks of cholera, diarrhea, dysentery, and many more with the mass spread within a time space with implications on health in the community antibiotics resistance has been a major problem as many microorganisms has evolved the effect of antibiotics by efflux pump and limiting permeability with modification of target. Thus, proper monitoring of water for microbiological analysis is a grand cause for curbing of an outbreak of diseases in the communities with cases of water-related borne diseases.

**Materials and Methods:**

A. **Sample Collection :**Four water samples (2 well and 2 river) were collected from Deulgaon raja city , in Maharashtra State, India , with one liters sterile bottle and were labelled prior to collection and were designated, they were taken to Microbiology laboratory of Samarth college of pharmacy Deulgaon raja, of Maharashtra State, India for further analysis (Fawole and Oso, 2004).

B. **Bacteriological Analysis:**The total heterotrophic bacterial count was performed on solidified nutrient agar plates and incubated at 37°C for 24 hours. At the end of the incubation period, sub culturing was done to obtain pure culture of bacterial isolates.
The Most Probable Number technique was used for enumeration of Total Coliform Count (Fawole and Oso, 2004).

C. **Identification and Characterization of Isolates:**The visual and biochemical techniques used to identify the pure bacterial strains. Pure cultures of the bacterial isolates were subjected to a variety of morphological and biochemical characterization tests, including the catalase test, MRVP (Methyl Red-VogesProskauer test), indole fermentation, color, shape, elevation, consistency, margin, and gramme staining (Olutiola, 1991). Results were compared with accepted references from Bergey's Manual of Determinative Bacteriology (Buchanan and Gibbons, 1974) in order to identify bacteria isolates.

**Table 1**
**Bacteria count of well and river water sample from Deulgaon Raja City, Maharashtra India**

| Sample | Bacterial Count (cfu/ml) |
|---|---|
| Sample I | $1.10 \times 10^3$ |
| Sample II | $1.09 \times 10^3$ |
| Sample III | $0.87 \times 10^3$ |
| Sample IV | $0.70 \times 10^3$ |

**Keys:**

**Sample I:**Amna river water

**Sample II:**Municipal corporations well water

**Sample III:** Purna river water

**Sample IV:**Dongaonkar well water

**Table 2**
**Most probable record of coliform bacteria of well and River water sample from Deulgaon Raja City, Maharashtra India**

| Sample | Coliform Count (MPN/100ml) |
|---|---|
| Sample I | 22 |
| Sample II | 392 |
| Sample III | 22 |
| Sample IV | 392 |

**Keys:**
**Sample I:** Amna river water

**Sample II:** Municipal corporations well water

**Sample III:** Purna river water

**Sample IV:** Dongaonkar well water

**Discussion:**Disease transmission via faecal pollution of water sources is a frequent and well-documented phenomena, especially in developing and underdeveloped nations (WHO, 1996). The availability of purified pipe-borne water is uncommon in Deulgaon raja city's majority of residential areas as well. Public water supply is highly irregular even in these places. More than 60% of the population is from the poor or average classes, who are compelled to dig wells as a substitute for boreholes since they cannot afford the exorbitant price of borehole drilling for drinking and hygienic purposes. The well water sample used in this examination had a viable bacterial count, which is a gauge of its microbial burden (0.70 to 1.09 × $10^3$ cfu/ml) and river water (0.87 to 1.10 × $10^3$ cfu/ml) which exceeded the commended limit (<500cfu/ml). This shows that the wells well water contain very high level of microbial contaminant that make water obtained from them a threat to public health. The values obtained for the samples from the river water were higher than well water from. This is possibly gross contamination due to particles from the surroundings. However, the sanitary quality of potable water is determined primarily by the kinds of microorganisms present rather than by the microbial count This result also confirm with earlier report of Kale *et al*., (2016) The most probable number (MPN) per 100 ml obtained for the well water samples has 22 MPN/100ml while river water has 392 MPN/100ml which clearly exceeded standard limit set by WHO, (2014). This suggest that the well and river water samples have been contaminated by potentially dangerous

**Table 3**
**Colonial morphology of the isolates of well and river water sample from Deulgaon Raja City, Maharashtra India**

| ISOLATES | COLOUR | EDGES | OPTICAL CHARACTRASTICS | RAISE OR FLAT | WET/ DRY | MUCOID/NON MUCOID |
|---|---|---|---|---|---|---|
| **IA** | Greyish-White | Smooth | Opaque | Slightly raised | Wet | Non- mucoid |
| **IB** | Cream | Irregular | Opaque | Flat | Wet | Mucoid |
| **IC** | Whitish | Irregular | Opaque | Raised | Wet | Mucoid |
| **IIA** | Greyish-White | Smooth | Opaque | Slightly raised | Wet | Non- mucoid |
| **IIB** | Greyish-White | Smooth | Opaque | Raised | Wet | Non- mucoid |
| **IIIA** | Greyish-White | Smooth | Opaque | Slightly raised | Wet | Non- mucoid |
| **IIIB** | White | Smooth | Opaque | Flat | Wet | Non- mucoid |
| **IVA** | Greyish-White | Smooth | Opaque | Slightly raised | Wet | Non- mucoid |
| **IVB** | Greyish-White | Smooth | Opaque | Slightly raised | Wet | Non- mucoid |
| **IVC** | White | Smooth | Opaque | Raised | Wet | Mucoid |

**Keys:**

**Sample I:**Amna river water

**Sample II:** Municipal corporations well water

**Sample III:**Purna river water

**Sample IV:** Dongaonkar well water

micro-organism and are therefore not fit for drinking and domestic purposes. This was confirmed by the characterization of the isolates from the well water samples from the locations under study which were highly contaminated with *Escherichia coli, Alcaligensspp, Streptococcus species, Yesinia enterocolitica, Salmonella spp, Enterobacter species,*and contain very high level of microbial contaminant that make water obtained from them a threat to public health. The values obtained for the samples from the river water were higher than well water from. This is possibly gross contamination due to particles from the surroundings. However, which were highly contaminated with *Escherichia coli, Alcaligensspp, Streptococcus species, Yesinia enterocolitica, Salmonella spp, Enterobacter species*, and *Lactobacillus spp.* The most predominant is that the enteric coli forms Escherichia coli. These are pathogenic organisms mostly of fecal origin. Any water source used for drinking or cleaning purpose should not contain any organism of fecal origin (Olowe *et al.*, 2005).

Presence of enteric coliforms especially Escherichia coli makes the water samples unsuitable for human consumption according to the guidelines set by WHO for the evaluation of bacteriological quality of drinking water (WHO, 2014).

**Table 4**
**Morphological and biochemical characteristics of well and river water sample from Deulgaon Raja City, Maharashtra India**

| ISOLATES | GRAM REACTION | SHAPE | CATALESE | COAGULASE | OXIDASE | IODOLE | METHYL RED | MOTILITY | SUGER FERMENTATION | MICROORGANISAM |
|---|---|---|---|---|---|---|---|---|---|---|
| **IA** | -ve | Rod | +ve | -ve | -ve | +ve | +ve | Motile | +ve | *Escherchia coli* |
| **IB** | +ve | Rod | +ve | -ve | +ve | -ve | -ve | Motile | -ve | *Alcaligensspp* |
| **IC** | +ve | Cocci | -ve | -ve | -ve | -ve | -ve | Non-Motile | +ve | *Streptococcus spp* |
| **IIA** | -ve | Rod | +ve | -ve | -ve | +ve | +ve | Motile | +ve | *Escherchia coli* |
| **IIB** | +ve | Rod | +ve | +ve | -ve | -ve | +ve | Non-Motile | +ve | *Yesinsiniaenterocolitica* |
| **IIIA** | +ve | Rod | +ve | +ve | -ve | -ve | +ve | Motile | +ve | *Salmonella spp* |
| **IIIB** | -ve | Rod | +ve | -ve | -ve | -ve | -ve | Motile | +ve | *Enterobacter spp* |
| **IVA** | -ve | Rod | +ve | -ve | -ve | +ve | +ve | Motile | +ve | *Escherchia coli* |
| **IVB** | +ve | Rod | +ve | +ve | -ve | -ve | +ve | Motile | +ve | *Salmonella spp* |
| **IVC** | +ve | Rod | -ve | -ve | -ve | -ve | -ve | Non-Motile | +ve | *Lactobacillus spp* |

**Keys:**

**Sample I:**Amna river water

**Sample II:** Municipal corporations well water

**Sample III:**Purna river water

**Sample IV:** Dongaonkar well water

Apart from environmental hygiene and population density, the presence of Salmonella species in some of the wells in this area may also be attributed to drainage and flooding from contaminated surface water into unprotected well shafts. Findings from this study clearly highlight the non-conformity of well water samples studied with the WHO standard recommendation for safe potable water. A situation where enteric pathogens are grossly isolated from sources of water consumed by humans is a serious problem which calls for vigilance on the part of the authorities as it signals possible future outbreak of water borne diseases. Such disease outbreaks may spread widely within the country and even possibly extend to neighboring countries. It may also be due to poor sanitary condition around the areas where such wells are located or drawing water from the wells with contaminated containers, a practice that is common among the users since individuals bring along their own water containers in some cases. The high morbidity that is recorded from enteric diseases such as diarrhea, dysentery and typhoid fever in the country may be due to wide spread consumption of contaminated well water.

**Conclusion:** These sources' analysed water is used for drinking, cooking, washing dishes, and bathing. Due to the presence of harmful microorganisms, there is a higher risk of contracting water-borne illnesses including diarrhoea and salmonellosis, among others, because runoff and sewage from open defecation are closer to the water source.

**References**

1. Amira, P. A., C. V. Ofoegbu., and T. Morrision. (2011). Hydro chemical assessment of groundwater quality in parts of Niger Delta. Environmental geology, vol. 14, no. 3, pp. 195-202.
2. Bonde, G. J. (2007). "Bacterial Indication of Water Pollution in Advances in Aquatic Microbiology," Academic Press, London.
3. Fawole, M. O. and Oso, B. A. (2004). Characterization of Bacteria: Laboratory Manual of Microbiology. 4th Edition, Spectrum Book Ltd., Ibadan, 24-33.
4. Ferner, H.I. (2001). Geological and hydrogeological influence on the Nigerian environment. Journal of water resources, Vol. 2, pp. 36-44.
5. Ogwuegbu, M. O. C., Muhanga, W. (2005), Investigation of lead concentration in the blood of people in the copper belt province of Zambia. Journal of the Environment, 1:66–75.
6. Olowe, O. A., Adekunle F. M., Oladele G.P. (2005). Bacteriological Quality of Water Samples in Osogbo metropolis," African Journal of Clinical and Experimental Microbiology, Vol. 6, No. 3, pp. 219-222.
7. Kale, B. U., Kadam, P. M., Gaikwad, S. B. (2016) Assessment of fluoride concentration and water quality of Khadakpurna Reservoir of Buldana District, Maharashtra, India. International Journal for Research in Applied Science and Engineering Technology 2016 Vol.4 No.10 pp.634-636
8. World Health Organization and Joint Monitoring Programme Report, WHO/JMPR. (2014). Water Sanitation Health.
9. World Health Organization, (1996). "Guidelines for Drinking Water Quality: Health Criteria and other Support Information. pp. 18-97.