# A Study on Seasonal Variation in the Physico-chemical Assessment of MPN and Fluoride Analysis of Drinking Water of Gandhinagar Area of Bhopal

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## ABSTRACT

Determination of fluoride concentration of sampling stations from different sites in and around villages near Gandhinagar of Bhopal was carried out by using selective fluoride ion-electrode. Determination of coliform bacteria/MPN  of drinking water samples  collected from various places by using $H_2S$ paper strip method and checked form black coloration in paper strip.

**Key words:** Determination, Fluoride ion concentration, Drinking water, Fluorosis, Coliforms, MPN (*myeloproliferative neoplasm*)

## INTRODUCTION

Bhopal the capital of Madhya Pradesh territory the largest state of India. Bhopal is situated on 23°16'N Latitude and 77°25' Longitude and is located on Hard pink sand stone of Vindhya region Fluoride concentration in India, creates health problems and fluorosis. The disease previously called as "Mottled teeth" reported in Madras City (1933). Most of the population of 18 states out of 35 states in India are well affected with dental, skeletal and non-skeletal fluorosis, which southern India is badly affected by "Fluorosis". Fluoride in drinking water is 1.0-1.5 mg/l recommended by WHO (2004).

Fluoride concentration has analyzed by using ion selective electrode and ORION 407A meter followed by standards as prescribed by APHA (1992) . The water samples was preserved by adding total ionic strength adjustment Buffer (TISAB)  in 1:1 radi and analysis for fluoride levels is calculate by standard curve platted on a semilog graph conc.(Log axis) vs mV. Teofia and Teofia index (TTI 1991) has commonly used to score dental fluorosis in several endemic areas of this country

The present investigation describe the qualitative and quantitative assessment of different water samples collected different sampling stations of study are collected from various sampling places in 2011-2012. by using $H_2S$ paper strip method and checked for black coloration in paper strip. A total of 5 types of bacterial colonies were identified by biochemical, cultural and microscopic examination technique. *Escherichia coli*, *enterobacter* were dominant followed by *Klebsiella pneumonae*, *Salmonella typhi*, and *Proteus vulgeris*. concentration of bacterial colonies was maximum in October followed by November, December and minimum in May.

The goal of household water treatment programs, like the CDC safe water system, is to reduce diarrheal disease in users by improving the microbiological quality of stored household water. Thus, testing for microbiological contaminants is useful to determine it:

´     Household drinking water is contaminated before program initiation; and
´     An intervention improves the microbiological quality of stored household water.

Microbiological indicators are bacteria shown to be associated with disease-causing organisms, but do not cause disease themselves. The three common micorbiological indicators are : (1) total coliform bacteria; (2) fecal (thermotolerant) coliform bacteria; and (3) Escherichia coli. A fourth indicator, production of hydrogen sulfide, has recently been used as well.

**Total Coliform Bacteria**

Disease-causing organisms can be present in water in small numbers and pose a human health risk.  Because of this, indicators of disease-causing organisms present in higher concentrations were initially developed to assess drinking water safety.  Because there are numerous coliform bacteria in the intestinal tracts of humans, and each person discharges between 100-400 billion per day, this group was initially chosen as the indicator organism for drinking water safety.

**Fecal (Thermotolerant) Coliform Bacteria**

To provide a more accurate indicator of human health risk, the fecal coliform group was developed. This group is also defined by the laboratory method, and includes those Gram-negative rod bacteria that, at $44 \pm 0.2$ degrees Celsius, either: 1) ferment lactose with gas production (for MPN and P/A testing), or 2) produce a distinctive colony on a suitable mediu  (for MF testing). This subgroup includes the genus *Escherichia*, and some species of  *Klebsiella,* Enterobacter, and Citrobacter. The terms fecal coliform bacteria and thermotolerant coliform

bacteria are used interchangeably.

***E. coli.  Escherichia coli (E. coli)***

is a bacteria that colonizes the gastrointestinal tract of humans and other mammals shortly after birth and is considered part of our normal intestinal flora.  Some types of *E. coli*, such as *E. coli* O157:H7 possess virulence factors and can cause diarrheal disease in humans, but most types of E. coli are harmless.  A single gram of fresh feces may contain as many as 1,000,000,000 E. coli. The mammalian gut is the normal habitat for E. coli, and, unlike other coliform bacteria, they are not normally found in uncontaminated waters.  This makes *E. coli* an ideal indicator for human health risk.  WHO states, "The presence of *E. coli* in water always indicates potentially dangerous contamination requiring immediate  attention" (4). Due to its high prevalence and disease-causing properties, *E. coli* is a solid microbiological indicator.  However, in some less contaminated environments, there is  not  enough *E. coli* present to  calculate treatment process efficiency.  When sampling for both human health risk and treatment efficiency a combined total coliform/fecal coliform bacteria test and *E. coli* test may need to be completed.

The World Health Organisation (WHO) and united states environmental protection Agency (USEPA)  both use microbiological indicators as the guideline value or standard for safe drinking water. The WHO guideline value is that E. coli and thermotolerant (Fecal) Coliform bacteria "Must not

**Table 1: Physico-chemical assessment of drinking water of Gandhi Nagar
Area of Bhopal City 2011-12
Mean Seasonal Value (Pre and Post monsoon )**

| Parameters | Unit | $SS_1$ | $SS_2$ | $SS_3$ | $SS_4$ | $SS_5$ | $SS_6$ | $SS_7$ | $SS_8$ |
|---|---|---|---|---|---|---|---|---|---|
| Fluoride | ppm | 0.16 | 0.27 | 0.18 | 0.40** | 0.30 | 0.28 | 0.20 | 0.10* |
| MPN | No./100ml | 64 | 98** | 90 | 65 | 36 | 70 | 44 | 32* |

$SS_1$ = Pardi Mohalla          $SS_5$ = Badbai
$SS_2$ = Jhirniya            $SS_6$ = Sector no. 5
$SS_3$ = Jodhpur Dhaba          $SS_7$ = Dawarika Dham
$SS_4$ = Pipalner            $SS_8$ = Nai Basti
**= maximum value          * =  minimum value

be detectable in any 100 ml sample" of water intended for drinking (1) The guidelines also note that "immediate investigative action must be taken if E. coli are detected", and that "medium-term targets for the progressive improvement of water supplies should be set" in developing countries having difficulties meeting the standards.

**Hydrogen Sulfide production**

A relatively new microbiologic indicator test is measuring hydrogen sulfide production. Some bacteria excrete hydrogen sulfide in their metabolic processes. Because hydrogen sulfide is easy and inexpensive to measure, this has been suggested as a new indicator. However, hydrogen sulfide can be produced via other mechanisms than bacterial metabolism, and so hydrogen sulfide production is, in effect, measuring an indicator (Hydrogen sulfide presence of bacterial) of an indicator (bacteria of human health risk).

The finding are similar with Kataria (1996) (2000) most of value found within the permissible limit as recommended by WHO 1978. The value of faceal/coliform recommended 10/100 ml index by WHO. Some values are found beyond the limits. Hence water samples analysed in the present study has found a suitable for drinking after proper required treatment.

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