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Microbial Contamination Assessment of Drinking Water Taken from Different Sources and Different Places of Lucknow, UP, India

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ABSTRACT

To ensure the safety of drinking waters, this study was conducted to identify the microbiological features of the water and their suitability for human consumption. Due to increased resource consumption brought on by the world's population growth, climatic change brought on by global warming, and industrial expansion, there is less access to sufficient amounts of water. It is essential to look into the root causes of water pollution, come up with remedies, take control of the pollution, and keep monitorability. This study presents a comprehensive evaluation of microbial contamination in drinking water across various sources and locations in Lucknow, Uttar Pradesh, India. Aiming to understand the extent and nature of waterborne microbial contaminants, water samples were collected from different sources, including municipal taps, groundwater (borewells and handpumps), rivers, and stored household water. These samples were analyzed for microbial content, specifically focusing on coliform bacteria, E. coli, and other pathogenic microorganisms, using standard microbiological methods.

Keywords: *E. coli, human consumption, microorganisms, and coliform bacteria*

INTRODUCTION

In addition to being used for drinking, drinking water is also utilized for cooking, cleaning, bathing, and taking showers. Water quality is vital to human health and should not be compromised. Drinking water must be hazardous to the public's health in any way, including chemical, microbiological, or physical. Additionally, none of these health risks might be direct or indirect. According to [1] drinking water of questionable microbiological purity might cause gastrointestinal disorders and even death. Thus, to improve drinking water safety and preserve public health, several studies have looked at the quality of drinking water in various regions of the world [2]. To safeguard human health from the harmful effects of any pollution, drinking water must be pure, healthy, and uncontaminated. According to [3] the purpose of drinking water law is to ensure the safety and quality of water meant for human use. Food may last for days, weeks, or even months without starvation, while water can only be gone for around four days. Despite being a vital component of life, water may harbor a variety of illnesses. It is possible to have soft or hard water, altered or natural, tap or bottle, carbonated or still [4]. There are two sorts of water: soft water and hard water, which come from separate sources. The concentration of calcium, magnesium, and occasionally iron in the water determines how hard the water is. The water gets harder the more minerals are in it. The ability of water to support different applications or activities is referred to as water quality. A variety of factors that restrict water consumption can be used to determine water quality. The primary causes of pollution in drinking water resources include improper distribution networks, growing industrialization, a lack of chlorination, inadequate waste management infrastructure, and inadequate water quality monitoring in treatment facilities [5]. In both urban and rural settings, groundwater is the main supply of potable water. Natural causes are not the cause of the groundwater issue. Groundwater pollution and health issues are caused by the continuous release of solid waste, sewage, and industrial effluents [6]. The World Health Organization (WHO) estimates that 2.2 million people die and 4 billion instances of diarrhea occur each year. Pollution poses a direct or indirect hazard to 1% of the groundwater level [7]. The most reliable markers of faecal contamination are nonpathogenic faecal microbes. Nonetheless, the primary instrument for determining the health risk posed by waterborne pathogens is always the presence of E. coli and faecal coliform [8].

MATERIALS AND METHODS

Twelve different sampling locations were chosen based on the east, west, north, and south directions of Lucknow, India, and water samples were collected in sterilized glass bottles. After that, they were transported on ice to the lab, where they were processed in 6-7 hours. The four samples in the collection were collected from three different places. The study area was divided into four parts. The traditional most probable number (MPN) method assessed the water's quality. Samples were inoculated into MacConkey broth tubes and incubated for 48 hours at 37 ±1ºC to identify coliforms. The positive tubes were subcultured in Brilliant green Bile Broth (BGBB) and incubated at 44.5±1ºC. Faecal coliform was detected by gas production in BGBB at 44.5±1ºC after a 48-hour incubation period. To detect fecal streptococci, water samples were inoculated into Azide Dextrose broth and incubated at 37.5±1ºC for 24 to 48 hours [9].

RESULT AND DISCUSSION

Microbiological assessment of drinking water of different zones from Lucknow city UP, India was analysed for Total Coliform (TC) and sampling sites was taken from East, West, North and South directions. First sample was taken from East direction

sample was Polytechnique named as PE1, PE2 and PE3. Second sample was from West direction Alambagh named as AW1, AW2 and AW3, third sample was taken from north direction of Lucknow city Indira Nagar named as IN1, IN2 and IN3 and last sample was taken from South direction of Lucknow city PGI named as PS1, PS2 and Ps3.

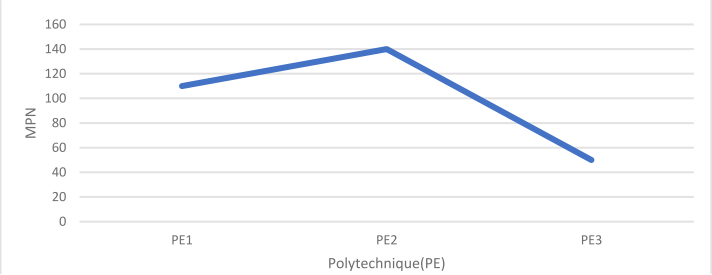

Fig 1 TC MPN Count of Polytechnique Sampling Site.

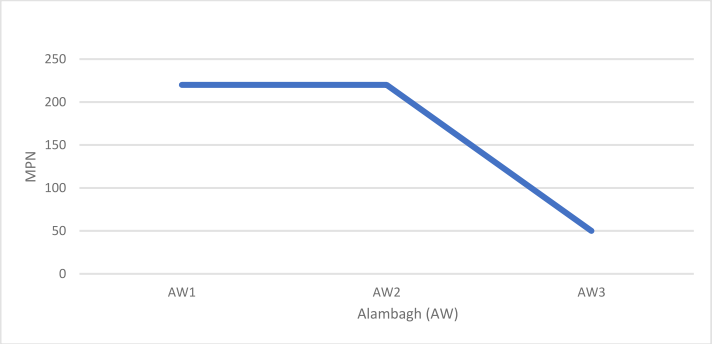

Fig 2. TC MPN Count of Alambagh Sampling Site.

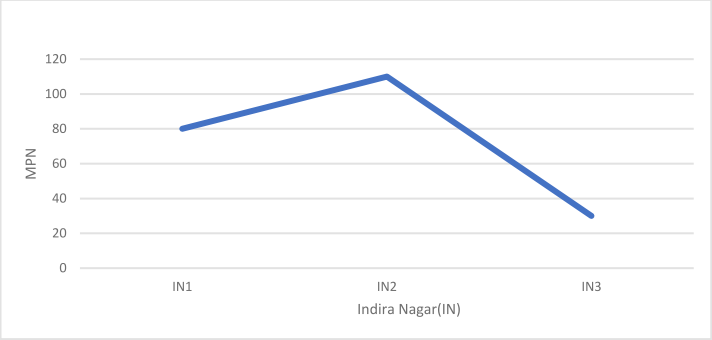

Fig 3. TC MPN Count of Indira Nager Sampling Site.

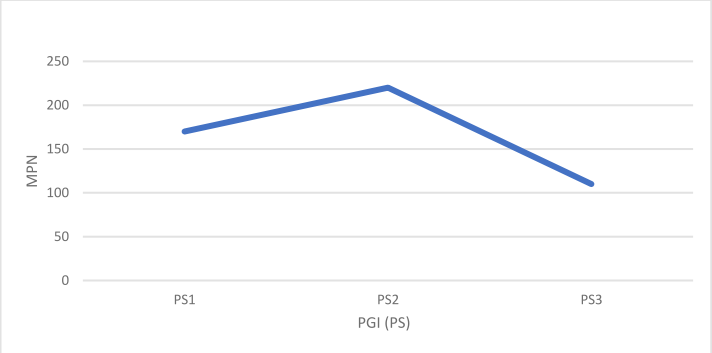

Fig 4. TC MPN Count of PGI Sampling Site.

TC from the first sampling site PE1 has 110, PE2 has 140 and PE3 has 50. TC from the second sampling site AW1 has 220, AW2 has 220 and AW3 has 50.TC from the third sampling site IN1 has 80, IN2 has 110 and IN3 has 30. TC from the fourth sampling site PS1 has 170, PS2 has 220 and PS3 has 110.

DISCUSSION

The study's findings on microbial contamination in different water sources in Lucknow underline several critical public health concerns. The variation in contamination levels across water sources can be attributed to factors like the efficacy of municipal water treatment, the integrity of the distribution system, groundwater quality, and practices related to water storage at the household level. This study sheds light on the critical issue of water safety in urban India and provides a foundation for further research and policy-making. Ensuring access to safe drinking water is not just a matter of public health but also of social equity and sustainable development.

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