“Assessing water Quality in Ernakulam: A Comprehensive Study of Contamination Levels and Public Health Implication”

PROJECT WORK BY

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CERTIFICATE

This is to certify that the project report entitled "ASSESSING WATER QUALITY IN ERNAKULAM: A COMPREHENSIVE STUDY OF CONTAMINATION LEVELS AND PUBLIC HEALTH IMPLICATIONS" submitted by Ms. RESHMA , Reg. No. AB22ZOO032 in partial fulfilment of the requirements of Bachelor of Science degree of Mahatma Gandhi University, Kottayam, is a bonafide work done under the guidance and supervision of Ms. Jemma pius and this is her orginal effort.

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DECLARATION

I MS. RESHMA, and hereby declare that the project report entitled "ASSESSING WATER QUALITY IN ERNAKULAM: A COMPREHENSIVE STUDY OF CONTAMINATION LEVELS AND PUBLIC HEALTH IMPLICATION " is a Bonafide record of work done by me during the academic year 2024-2025 in partial fulfillment of the requirements of Bachelor of Science degree of Mahatma Gandhi University, Kottayam.

This work has not been undertaken or submitted elsewhere in connection with any other academic course and the opinions furnished in this report is entirely my own.

RESHMA

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ABSTRACT

Ernakulam has evolved into a thriving economic hub, driven by industries like IT, tourism and healthcare, attracting a large number of youngsters. This study investigates the quality of drinking water in Ernakulam District, with a focus on the presence of *Escherichia coli* (*E.coli*) as a biological parameter. *E.coli*, a faecal coliform indicator, is derived from human and animal waste, and its presence in water indicates contamination. In this study, drinking water was collected from the South Railway Station and a flat in Vennala, Ernakulam. To assess the quality of the water, the total plate count of the samples was determined using the serial dilution and standard plate count methods. Both the flat water and station water samples were found to be contaminated, and the flat water provided by agencies was more contaminated. It is recommended that the water provided by these agencies be sterilized using appropriate methods before consumption.

Keywords: *E.coli*, faecal coliform, Drinking water quality, TPC Analysis.

INTRODUCTION

Worldwide, the use of bottled water has grown by 10% annually, with the largest rise occurring in developing nations (Gleick, P. H, 2004). Residents in cities rely on bottled water, which is more convenient and safer than tap water (Hu, Z., Morton, *et al*., 2011). According to the World Health Organization's drinking water guidelines, the amount of total coliform and *E.coli* in 100 millilitres of water cannot exceed 100 CFU per millilitre using the conventional plate count method (Kyaw, T. S, *et al*., 2015). Drinking water quality standards typically have three parameters: physical, chemical, and microbiological. One of the main causes of the health burden associated with water is microbial pollution. The greatest global health risk Between 70 and 80 per cent of health issues in underdeveloped nations are caused by water-borne illnesses (Jayana, B. L., *et al*., 2009).

Both total coliform bacteria and non-coliform species, such as heterotrophic bacteria, may pose a unique health danger to immunocompromised people (Sharon, O., *et al*., 2013). Faecal coliforms were found in 90% of the water samples (Edberg, S. C. L., *et al*., 2000). Instead of directly identifying pathogens, the World Health Organization (WHO) recommends that the microbial quality of drinking water be measured using faecal indicator bacteria, preferably *Escherichia coli*, which show the presence of faecal contamination (Guidelines for Drinking-Water Quality, 2008). The risk of pathogenic contamination from the faecal origin is determined by the presence of *E.coli* bacteria (Tharannum, S., *et al*., 2009; Bej, A. K., *et al*., 1990). *E. coli* is the most widely used test for indicator organisms, although it only shows the potential for faecal contamination and illness incidence, not the actual presence of faecal pathogens (Mahbub, K. R., *et al*., 2011). In this work, the Most Probable Number (MPN) approach, has been utilized for years with good results in drinking water analysis (Guidelines for Drinking Water Quality, 2008). The purpose of this study was to determine the level of bacteriological contamination in drinking water based on permissible limit results.

REVIEW OF LITERATURE

Waterborne Disease

A significant cause of morbidity and mortality globally, several infectious diseases are linked to water tainted by faeces (Leclerc *et al*., 2002; Theron and Cloete, 2002). Enteric pathogens, including bacteria, viruses, and parasites, are responsible for waterborne infections and are spread through the oral route of faeces (Grabow, 1996; Leclerc *et al*., 2002; Theron and Cloete, 2002). Numerous factors influence the spread of infection by these pathogenic microorganisms through water, including the microorganism's ability to survive in the water environment, the infectious dose needed to infect susceptible people, the water's microbiological and physicochemical quality, whether water treatment is present or not, and the time of year (Deetz *et al*., 1984; Leclerc *et al*., 2002; Theron and Cloete, 2002).

The temperature and nutrients are necessary for microorganisms like bacteria to survive in aquatic environments (Edberg *et al*., 2000; Leclerc *et al*., 2002). Certain intestinal bacteria can cause infections at concentrations as low as 101 cells, whereas other bacteria have infectious doses ranging from 107 to 108 (Edberg *et al*., 2000; Leclerc *et al*., 2002). While viruses can live for a long time in water, they are unable to reproduce outside of living cells (Raphael *et al*., 1985; Leclerc *et al*., 2002).

The Microbiological Quality of Water

Communities in underdeveloped nations are utilizing the most convenient source of water which is untreated (Sobsey, 2002; Moyo *et al*., 2004). According to WHO (2000), many of these water sources are exposed to external contamination from surface runoff, windblown debris, human and animal faecal pollution, and unsanitary collecting practices (Chidavaenzi *et al*., 1998; Moyo *et al*., 2004). Because it is technically challenging, costly, and time-consuming to detect every pathogenic bacterium in water, regular water testing processes do not use this method (Grabow, 1996). Rather, the microbiological quality of water is regularly evaluated using indicator organisms, which offer a simple, quick, and accurate way to determine the microbiological quality of water sources (Grabow, 1996).

Total Coliform Bacteria

According to Standard Methods (1995), total coliform bacteria are rod-shaped, aerobic or facultatively anaerobic, Gram-negative, non-spore-forming bacteria that digest lactose and release gas at 35°C. In addition to bacteria that may not be of faecal origin, such as *Klebsiella*

spp., *Citrobacter spp*., *Serratia spp*., and *Enterobacter spp*., total coliforms are bacteria that are found in nutrient-rich water, soil-decomposing vegetation, and drinking water with relatively high nutrient levels (Pinfold, 1990; Ramteke *et al*., 1992; WHO, 1996a). Membrane filtration with Endo agar and incubation at 35°C to 37°C for 24 hours to develop colonies with a golden-green metallic sheen is the suggested test for counting total coliforms (Standard Methods, 1995).

Total coliform bacteria are employed as a systems indicator in water quality studies to provide data on the effectiveness of water treatment (Standard Methods, 1995). Therefore, the presence of total coliform in water samples is a sign that there may be pathogenic *E. coli, Salmonella spp., Shigella spp., V. cholera, Campylobacter coli,* and opportunistic pathogenic bacteria like Klebsiella and Enterobacter that can grow in water environments (DWAF, 1996; Grabow, 1996). Consumers may get illnesses such salmonellosis, cholera, typhoid fever, gastroenteritis, and dysentery as a result of these pathogens and opportunistic microbes (DWAF, 1996; Grabow, 1996). People who have HIV/AIDS-related problems are especially vulnerable to infection by these microbes (DWAF, 1996).

Faecal Coliform Bacteria

Gram-negative faecal coliform bacteria are also referred to as presumptive *E. coli* or thermotolerant coliforms (Standard Methods, 1995). Other organisms that are not solely of faecal origin, such as *Klebsiella species, Enterobacter species*, and *Citrobacter species*, are included in the faecal coliform category (Standard Methods, 1995). Particularly, humans, birds, and other warm-blooded animals produce *Escherichia coli* in their faeces (WHO, 1996 a; Maier *et al*., 2000). Accordingly, faecal coliform bacteria are thought to be a more precise marker of faecal presence (Maier *et al*., 2000).

Faecal coliforms can be used as an indication in place of *E. coli* and are typically used to signify unacceptably high microbiological water quality (SABS, 2001). Other harmful bacteria, including *Salmonella* species, *Shigella* species, pathogenic *E. coli, V. cholera, Klebsiella* species, and *Campylo* bacteria species linked to waterborne illnesses, may be present in a water sample if faecal coliforms are detected (DWAF, 1996). The stability and resistance to disinfection processes of faecal coliform bacteria vary from species to species; they are unable to differentiate between human and animal faeces; they have low survival rates; and they have been found in water sources that were previously believed to be free of faecal pollution (Goyal *et al*., 1979; Fujioka *et al*., 1988).

E. Coli Bacteria

E. coli is the most widely used indicator of faecal pollution worldwide (Edberg *et al*., 2000). Recent faecal contamination of water samples is indicated by this Gram-negative bacterium, which is primarily found in the intestines of warm-blooded animals and humans (Rice *et al*., 1990; Rice *et al*., 1991; WHO, 1996a; Edberg *et al*., 2000). Gram staining, the presence of the enzyme β-glucuronidase, the lack of urease activity, the formation of acid and gas from lactose, and the production of indole are all examples of confirmation tests for *E. coli* (Mac Faddin, 1980; Rice *et al*., 1991; Standard Methods, 1995).

Human and Animal Faecal Pollution in Water

Consumers may contract infections from potentially harmful microbes found in water contaminated by human and animal waste (Sobsey *et al*., 1993; Gerba *et al*., 1996; Grabow, 1996; Leclerc *et al*., 2002; Theron and Cloete, 2002). Both human and animal faeces contain the most widely used faecal indicator microorganisms, such as *E. coli*, thermotolerant coliform bacteria, total coliform bacteria, and faecal enterococci bacteria. However, they are unable to distinguish between the sources of faecal pollution (Sinton *et al*., 1998). Other animals can act as reservoirs for human viral diseases, including rotaviruses, calicivirus, hepatitis E virus, reoviruses, somatic bacteriophages, and male-specific RNA bacteriophages (NRC, 2004). Because human exposure may result from the discharge of microbes into aquatic habitats by animal hosts, these species can therefore be significant potential sources of water source contamination (NRC, 2004). However, because it is more likely to contain enteric infections particular to humans, water tainted with human faeces is thought to pose a larger risk to human health (Sinton *et al*., 1998). Different degrees of success have been achieved even though a variety of microbiological and chemical markers have been described to identify the source of faecal pollution in water supplies (Sinton *et al*., 1998; Gilpen *et al*., 2002; 2003).

METHODOLOGY

SAMPLE COLLECTION

Water samples were collected from two places, a residential flat in Vennala, Ernakulam and South Railway Station in Ernakulam. Samples were collected in sterile bottles under aseptic conditions to prevent contamination. The bottles were tightly sealed and transported to the laboratory for further analysis.

DETERMINATION OF COLIFORMS IN WATER SAMPLES

The detection of coliforms in the water samples was performed following the procedures outlined in Chapter 4 of the Bacteriological Analytical Manual, with slight modifications**.**

MPN - PRESUMPTIVE TEST FOR COLIFORMS, FECAL COLIFORMS AND *E. COLI*

Coliforms are a broad group of bacteria commonly found in the environment, including soil, vegetation, and the intestines of animals and humans. They are used as an indicator of water quality, especially in detecting fecal contamination.

Materials Required: Lactose broth – 2x and 1x concentrations, test tubes, Durham tubes, cotton, distilled water, and a measuring cylinder.

Lactose broth was prepared by dissolving 1.3 g of lactose broth powder in 100 ml of distilled water for a 1x concentration and 2.6 g in 100 ml of distilled water for a 2x concentration. Approximately 5 ml of the lactose broth was transferred into sterile test tubes, each containing Durham tubes. The test tubes were properly plugged and sterilized by autoclaving at 121°C, 15 lbs of pressure, for 15–20 minutes.

For each water sample, six test tubes were prepared for the 1x concentration: three designated for the addition of 0.1 ml of water and three for 1 ml of water. Additionally, three test tubes were prepared for the 2x concentration, with each tube designated for the addition of 10 ml of the water sample. The lactose broth tubes were incubated at 37°C for 24 hours in a bacteriological incubator. Coliforms in the water sample ferment lactose, resulting in the formation of air bubbles in the Durham tubes. Test tubes showing air bubbles in the Durham

tubes were marked as positive for the presumptive test. The MPN (Most Probable Number) index was then calculated for each sample using these positive tube sets. The positive lactose broth tubes were further subjected to a confirmatory test with brilliant green lactose broth.

MPN - CONFIRMATORY TEST FOR COLIFORMS

Materials Required: Brilliant green lactose broth (BGLB), test tubes, Durham tubes, cotton, distilled water, and a measuring cylinder.

Brilliant green lactose broth was prepared by dissolving 4 g of BGLB powder in 100 ml of distilled water. Approximately 5 ml of the BGLB was transferred into sterile test tubes, each containing a Durham tube. The test tubes were properly plugged and sterilized by autoclaving at 121°C, 15 lbs of pressure, for 15–20 minutes.

For each positive lactose broth tube, 5 µl of suspension was transferred to the sterilized BGLB tubes. The tubes were then incubated at 37°C for 24 hours in a bacteriological incubator. Test tubes showing air bubbles in the Durham tubes were considered positive for coliforms and selected as positive tubes for the complete test using eosin methylene blue (EMB) agar.

MPN - COMPLETED TEST FOR *E. COLI*

Materials Required: Eosin methylene blue agar (EMB agar), conical flask, petri plates, cotton, distilled water, and a measuring cylinder.

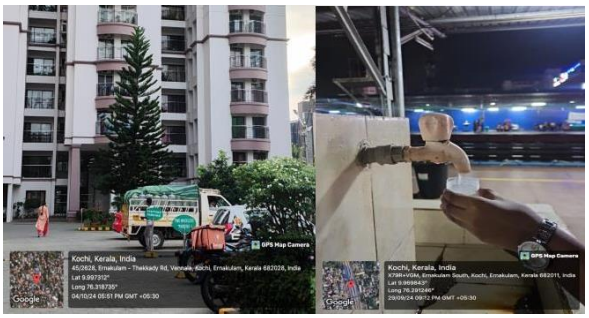
Eosin Methylene Blue (EMB) agar was prepared by dissolving 3.6 g of EMB agar powder in 100 ml of distilled water in a conical flask. The flask was properly plugged and sterilized by autoclaving at 121°C and 15 lbs of pressure for 15–20 minutes. After autoclaving, 20 ml of the medium was poured into sterilized petri plates under aseptic conditions and allowed to solidify. One loopful of suspension from positive BGLB tubes was then streaked onto the EMB agar and incubated at 37°C for 24 hours. Samples containing *E. coli* displayed a characteristic metallic green sheen on the EMB agar due to the dye uptake and acid production from lactose fermentation.

RESULT

SAMPLE COLLECTION

Water samples were collected from two distinct locations: a residential flat in the Vennala area and the South Railway Station in Ernakulam, Kerala. The selection of these sites provides a contrast between a typical domestic environment and a public, high-traffic location (Figure 1).

Fig. 1: Water samples collected from (a) a residential flat in Vennala and (b) the South railway station



(a) **(b)**

DETERMINATION OF COLIFORMS IN WATER SAMPLES

Coliforms in the water samples were detected using the procedures outlined in the **Bacteriological Analytical Manual (BAM).**

MPN - PRESUMPTIVE TEST FOR COLIFORMS, FECAL COLIFORMS AND *E. COLI*

The presumptive test was performed using LB broth at 1x and 2 x concentration (Table 1 and Figure 2).

Table 1: MPN Index of Presumptive Test for Coliforms in Water Samples from Residential Flat and Railway Station using Lactose broth

Sl. No.	Concentration	The volume of sample taken	Sample code	Result	MPN index
Flat					
1	1X	0.1 ml	a	+	2
			b	+	
			c	-	
2	1X	1 ml	d	-	1
			e	+++	
			f	-	
3	2X	10ml	g	+++	3
			h	+++	
			i	+++	
Railway station					
4	1X	0.1 ml	j	+	3
			k	++	
			l	+	
5	1X	1 ml	m	-	2
			n	+	
			o	+	
6	2X	10ml	p	+	3
			q	+	
			r	+	

* - Absence of air bubble, + Single and very small air bubble, ++ Multiple small air bubbles, +++ Large air bubble *

Fig. 2: Lactose broth tubes with Durham tubes for the presumptive test of: Residential flat water sample (a1 to a 4) Railway station water sample (b1 to b 3)

a1 **a2** **a3** **a4**

b1 **b2** **b3**

For both samples, a total of 9 lactose broth tubes were tested: 3 tubes for 1X concentration with 0.1 mL of the water sample, 3 tubes for 1X concentration with 1 mL of the water sample, and 3 tubes for 2X concentration with 10 mL of the water sample. After incubation, six tubes from the flat-water sample (labelled a, b, e, g, h, and i) were found to be positive for coliform bacteria, as indicated by air bubble formation in the Durham tubes. Similarly, eight tubes from the railway station water sample (labelled j, k, l, n, o, p, q and r) also showed positive results. These findings indicate that the positive tubes contain coliforms capable of fermenting lactose, resulting in the production of gases that lead to the formation of air bubbles in the Durham tubes.

The MPN index of the water samples was calculated by noting the combination of positive lactose broth tubes from the presumptive test. For the flat-water sample, the MPN index was determined to be 120, represented by the combination (3, 1, 2). In contrast, the railway station water sample had a higher MPN index of 290, corresponding to the combination (3, 2, 3). The positive lactose broth tubes were further confirmed through a confirmatory test using BGLB (Brilliant Green Lactose Broth) tubes.

MPN - CONFIRMATORY TEST FOR COLIFORMS

The confirmatory test for coliforms was conducted using Brilliant Green Lactose Broth (BGLB). A 5 µL aliquot of suspension from each positive lactose broth tube was inoculated into sterile BGLB tubes containing Durham tubes to facilitate the detection of gas production (Table 2 and Figure 3).

Table 2: Confirmatory Test for Coliforms in Water Samples from Residential Flat and Railway Station using Brilliant green lactose broth

Sl. No.	Sample	Sample code	Result
1	Flat	a	-
		b	-
		e	+++
		g	+++
		h	+++
		i	+++
2	Railway station	j	-
		k	++
		l	-
		n	-
		o	-
		p	++
		q	-
		r	-

* - Absence of air bubble, + Single and very small air bubble, ++ Multiple small air bubbles, +++ Large air bubble *

Fig. 3: Brilliant green lactose broth tubes with Durham tubes for the confirmatory test of: Residential flat-water sample (a) Railway station water sample (b)

(a) **(b)**

Out of the 14 BGLB tubes tested, 4 tubes from the flat-water sample (labelled e, g, h and i) and 2 tubes (labelled k and p) from the railway station water sample were found to be positive for coliforms, as indicated by the formation of air bubbles in the Durham tubes. To further validate the findings, the positive BGLB tubes were subjected to a complete test using Eosin Methylene Blue (EMB) agar.

MPN - COMPLETED TEST FOR *E. COLI*

Eosin Methylene Blue (EMB) agar is a selective and differential medium used for the identification of coliform bacteria based on their biochemical properties. The medium contains eosin Y and methylene blue dyes, which inhibit the growth of Gram-positive bacteria while permitting the growth of Gram-negative bacteria, including coliforms. Upon inoculation of the positive BGLB cultures onto EMB agar plates, coliforms typically produce colonies that range in appearance from dark purple to metallic green. This colouration results from acid production during lactose fermentation, which interacts with the dyes in the medium, thus providing a visual confirmation of the presence of coliforms.

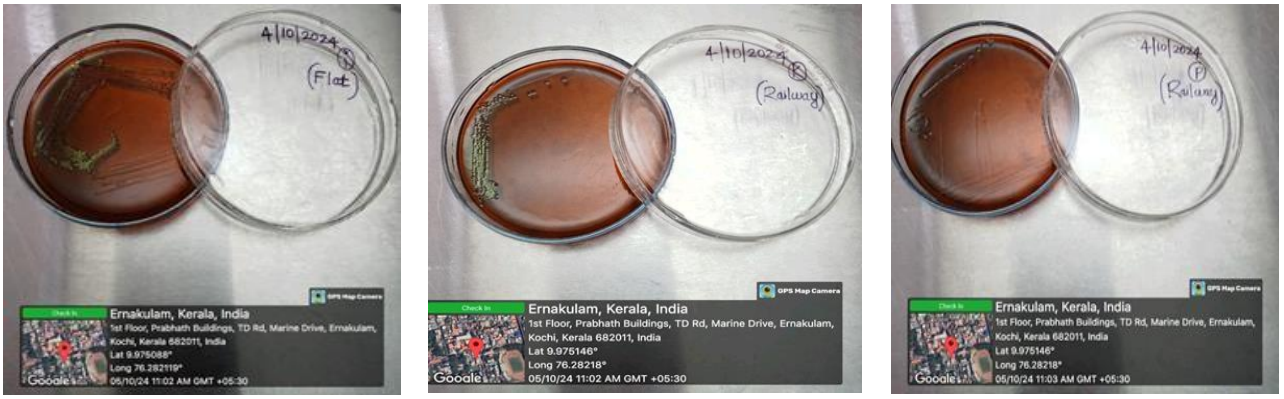
A total of 6 tubes were streaked onto EMB agar, consisting of four tubes from the flat water sample (labelled e, g, h, and i) and two tubes from the railway station water sample (labelled k and p). After incubation, 5 plates demonstrated positive results, with four from the flat water sample (labelled e, g, h, and i) and one from the railway station sample (labelled k) exhibiting characteristic metallic green colonies on the EMB agar (Table 3 and Figure 4). The presence of these metallic green colonies indicates strong lactose fermentation, confirming the presence of coliforms in both water sources.

Table 3: Complete Test for Coliforms in Water Samples from Residential Flats and Railway Stations using Eosin Methylene blue agar

Sl. no.	Sample	Sample code	Observation	Result
1	Flat	e	Metallic green colouration	Presence of *E. coli*
		g	Metallic green colouration	Presence of *E. coli*
		h	Metallic green colouration	Presence of *E. coli*
		i	Metallic green colouration	Presence of *E. coli*
2	Railway	k	Metallic green colouration	Presence of *E. coli*
		p	No metallic green colouration	Absence of *E. coli*

Fig. 4: Eosin methylene blue agar plates for the confirmatory test of: Residential flat water sample (e, g, h and i) Railway station water sample (k and p)

e **g** **h**



i **k** **p**

In conclusion, both the flat water and railway station water samples were found to be contaminated with coliforms, with the flat water provided by agencies being more prone to contamination. It is recommended that the water provided by these agencies be sterilized using appropriate methods before consumption. Additionally, both agencies and the railway authorities should adopt stringent measures to ensure the safety and quality of drinking water.

This is particularly concerning for individuals such as hostel residents who come to Ernakulam, consume water at the railway station, and stay in flats or other accommodations. These individuals may be exposed to coliform contamination at multiple points, increasing their risk of infection. Moreover, when they travel back to their home districts, they may unknowingly carry the infection from both the railway station and the flat, creating a potential chain of infection transmission.

DISCUSSION

The study, assessing drinking water quality in Ernakulam from a Flat and Railway Station, highlights critical findings about the microbial contamination of water sources, specifically the presence of *E. coli*. The detection of *E. coli* in water samples from both a residential flat and a railway station raises significant public health concerns, given that *E. coli* is a widely recognized indicator of faecal contamination. This bacterium's presence suggests potential exposure to waterborne pathogens that can cause gastrointestinal diseases, including diarrhoea, dysentery, and, in severe cases, haemolytic uremic syndrome (HUS).

For thousands of commuters, railway workers, and tourists each day, railway stations are essential sources of water. Given the increased danger of disease transmission in crowded public areas, it is imperative to ensure the safety of drinking water in railway stations. According to a study on Indian railway stations, including Ernakulam Junction, the water quality frequently falls short of safety requirements because of pollution from several causes, including outdated pipelines, inappropriate storage, and a lack of routine testing. Ernakulam Junction Railway Station set up an *E. Coli* testing lab in 2017 to monitor water quality and guarantee prompt action when contamination is found to mitigate such dangers. Water quality monitoring at many minor railway stations is still uneven despite this effort.

The primary sources of *E. coli* contamination in railway station drinking water includes Poor Maintenance of Storage Tanks: Railway stations store large volumes of water, but lack of regular cleaning leads to microbial growth. Cross-contamination from Sewage Lines: Leaks in sewage pipelines or improper disposal of wastewater can allow *E. coli* to enter drinking water sources. Human Activities: Unhygienic practices by passengers, railway workers, and vendors contribute to microbial contamination.

Residential apartments in Ernakulam frequently rely on a mix of groundwater, municipal water, and water kept in overhead tanks, in contrast to train stations where drinking water is obtained from extensive municipal sources. The main causes of *E. coli* contamination in these environments include outdated plumbing systems, uncontrolled groundwater use, and inadequate sanitation. Numerous cases of *E. coli* contamination in Ernakulam residential units have been reported recently. Due to drinking water tainted with *E. coli*, more than 300 people in a high-rise apartment complex in Kochi became ill. The apartment's overhead storage tanks, which had not been cleaned in several months, were found to be contaminated.

The presence of *E. coli* in drinking water poses severe health risks, particularly to children, the elderly, and immunocompromised individuals. Contaminated water can cause, Diarrhoea, vomiting, and stomach cramps. In extreme cases, pathogenic strains of *E. coli* can cause kidney failure (Haemolytic Uremic Syndrome). Repeated exposure to contaminated water can lead to malnutrition and weakened immunity.

Regarding railway stations, Extend testing facilities beyond Ernakulam Junction and other key stations. Establish a required routine for cleaning railroad water tanks. Fix leaks and make sure sewage is disposed of properly. For apartments in residential buildings, the Tanks should be cleaned and disinfected every three months by the residents. Boiling water, chlorination, and UV filtration should all be promoted. Stricter water quality monitoring in apartment buildings should be mandated by local authorities.

Implications of *E. coli* contamination, the results underscore the necessity for stringent water quality management, particularly in urban areas. Insufficient disinfection, treatment facility malfunctions, and improper maintenance of storage tanks are some reasons for contaminated water from flats, which drinking water agencies provide. Meanwhile, water from the railway station could reflect inadequate sanitation infrastructure and the risks associated with high foot traffic. Such findings necessitate targeted interventions, including regular disinfection of storage tanks and improved public awareness about hygiene practices related to water storage and consumption. These results align with similar studies conducted in urban settings where *E. coli* contamination was prevalent. A study reported similar contamination in urban drinking water sources in India, linking the issue to insufficient water treatment facilities and improper waste management systems (Pathak *et al*., 2018). The current study reinforces the idea that urbanization, coupled with inadequate infrastructure, exacerbates water quality challenges.

Recommendations and Future Directions, it is imperative to, implement routine microbiological testing of water sources, establish robust water treatment protocols, particularly in high-risk areas like railway stations, and conduct further studies to identify the specific sources of contamination, such as leaking sewer lines or unhygienic handling practices.

CONCLUSION

This study effectively emphasizes the pressing need for improved drinking water management in urban areas. The persistent presence of *E. coli* in drinking water sources not only compromises public health but also indicates systemic failures in water quality governance. It is recommended that the water provided by these agencies be sterilized using appropriate methods before consumption. This is particularly concerning for individuals such as hostel residents who come to Ernakulam, consume water at the railway station, and stay in flats or other accommodations. These individuals may be exposed to coliform contamination at multiple points, increasing their risk of infection. Moreover, when they travel back to their home districts, they may unknowingly carry the infection from both the railway station and the flat, creating a potential chain of infection transmission.

Drinking water contamination by *E. coli* in Ernakulam district remains a serious concern, affecting both railway stations and residential apartments. While railway stations face risks due to public exposure and maintenance lapses, residential flats struggle with inconsistent water treatment and storage issues.

Addressing these challenges requires a collaborative effort between government authorities and railway management. apartment residents, and water quality experts. Strengthening monitoring, improving sanitation, and adopting proper water treatment techniques will be crucial in ensuring safe drinking water for all.

By implementing these measures, Ernakulam can set an example in water safety and public health management, reducing the risk of waterborne diseases and ensuring a healthier living environment for its residents.

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