



Prevalence of *E.coli* isolates from different source of water in Meghalaya

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Abstract

Harmful bacteria strain of *E.coli* could be present in public drinking water sources. It has become an unignorable public health concern across the world, such as water borne epidemic outbreak causes severe diarrhoea in human any many more. The study determine and identify the prevalence of *E.coli* in public drinking water sources in the state Meghalaya through morphological and cultural characteristic, using standard microbial cultural technique. In order to improve community sanitation and hygiene practices. Out of 200 water samples analyse, 58 samples showed the present of *E.coli*, obtaining the overall, prevalence of 29%. 24 samples (12%) were observe from raw water, 16 samples (8%) from tap water, 10 samples (5%) from health center water, 5 samples (2.5%) from treated water, and 3 samples (1.5%) from packaged drinking water. The study concludes with a firm recommendation to firstly treat, boil, and filter the raw and tap water before consumption or it use in daily washing of fruits and vegetables to avoid any possibility of water borne outbreak.

Keywords: *Escherichia coli*, water borne outbreak

Introduction

Water is the primary necessity of life. It is a critical part of the human diet, however, many water sources are unhealthy or unfit for drinking because they contain harmful chemicals and biological agents. Public drinking water sources in urban could potentially harbor dangerous strains of *E.coli* from numerous sources, such as from human and animal carriers. It is strongly believed that after taking contaminated water, there are chances that within a few days, the organisms will settle in the gut ^[1]. The world health organization (WHO) estimates that 80% of poor health in developing countries is water sanitation-related ^[2, 3]. The unprotected water sources can be contaminated with microbes through rainfall runoff and agriculture, mixing with sewage effluents and fecal from the wild ^[4, 5]. Bacterial contamination of drinking water is a major water-borne disease, where water sources are exposed to multiple fecal-oral transmission pathways ^[6]. *E.coli* infections associated with drinking water remain a major public health concern as its common members of the intestinal micro-flora of both humans and animals, known to live as commensally or opportunistic pathogens in acute infection of the urinary tract ^[7]. The rapid increase in human and animal population had changed the global ecology and environmental quality, therefore safety of water has become a matter of great concern to increase the pressure on natural water resources. These water sources are contaminated with bacteria, protozoa, viruses, fungi, and algae which can lead to outbreaks of water-borne diseases in humans ^[8]. Nowadays, for detection of *E. coli* in water, conventional techniques that are standardized and regulated are used, these techniques are based on the cultivation of bacteria such as most probable number count, membrane filtration, and method used for identification, among others. ^[9, 10]. Membrane filtration is the most used method for the enumeration of coliform in drinking water due to its feasibility. Regardless of that, all these techniques present important limitations. The most important is continuing for a long time incubation for the final detection of *E.coli*, which required at least 24-28 hours ^[11, 12]. The presence of *E.coli* indicates that there is a high risk of the incidence of other bacteria and viruses of fecal origin, which many are pathogenic. Hence, *E.coli* is used as an indicator organism to identify water samples that may contain unacceptable levels of fecal contamination ^[13, 14].

Material and Methods

A total of 200 samples were collected from different resources of public drinking water in a region of Meghalaya. The samples were collected into 500 ml sterile bottles. The water samples were allowed to flow for

one to two minutes before being on the sterile bottles. The water samples then transported to the laboratory for bacteriological analysis.

Bacteriological analysis

Three sets of culture tubes each were arranged. MacConkey broth was aseptically prepared according to the manufacturer's instructions. 150 ml, 30 ml, and 15 ml of MacConkey broth were arranged according to the sets of the culture tubes and placed the Durham tube inside the culture tube. After sterilization, the water samples were pipetted out 50ml on the first tube i.e, 150 ml tube, 10 ml into 30 ml, and 5 ml on 15ml, incubation for 24-48 hours at 37°C. The tubes were examined for color changes and gas production. The tubes showing colors from purple to yellow indicated fermentation, while gas trapped in the Durham tube indicated gas production. The color change after incubation indicated that the water was contaminated with *Escherichia coli*. The MPN was estimated from the McCready table.

Plating on selective media

The samples were streaked on the selective media, eosin methylene blue agar (EMB, Hi-Media) plates, and incubated at 37° C for 24 hours. Colonies showing metallic sheen were picked up and considered as presumptive *E.coli*.

Membrane Filtration technique

The membrane filter method was acquired for quantitative analysis in which 250 ml of the sample were poured into the membrane funnel assembly and allowed to draw completely through 0.45µ micrometer filter paper and then aseptically placed on the chromogenic coliform agar (CCA) agar media and incubated for 24 hours at 37°C for identification and counting of bacteria. The membrane filter showing dark blue colonies was considered as *E.coli* while other colonies like pinkish and mucous were considered as the total coliform bacteria. We refer with the International Standard Organization - IS 15185: 2002 and ISO 9308-1: 2014.

Result

According to WHO, the presence of *E. coli* in drinking water provides conclusion evidence of very recent fecal pollution (WHO, 2011). The most recommended technique used to determine the fecal contamination of water by *E. coli* are multiple tube fermentation and membrane filtration method.

Out of 200 samples examined, 58 of were obtained *E. coli* showing an overall prevalence of 29%. the highest prevalence of *E. coli* was observed in raw water (12%) followed by tap water (8%), health center water, hospital (5%), packaged drinking water (1.5%) and treated water (2.5%).

Table 1: Prevalence of *E.coli* in different public water sources of Meghalaya region

Sl.no	Sample type	No. of samples	No. of samples positive for <i>E.coli</i>	Prevalence of <i>E.coli</i> (%)
1.	Raw water	73	24	12%
2.	Tap water	58	16	8%
3.	Health centre water	20	10	5%
4.	Treated water	36	5	2.5%
5.	Package drinking water	13	3	1.5%
	Total	200	58	29%

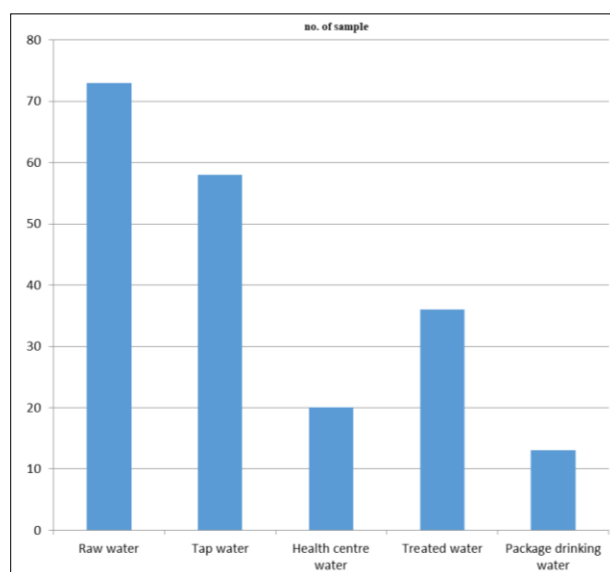


Fig 1: Number of different type of samples

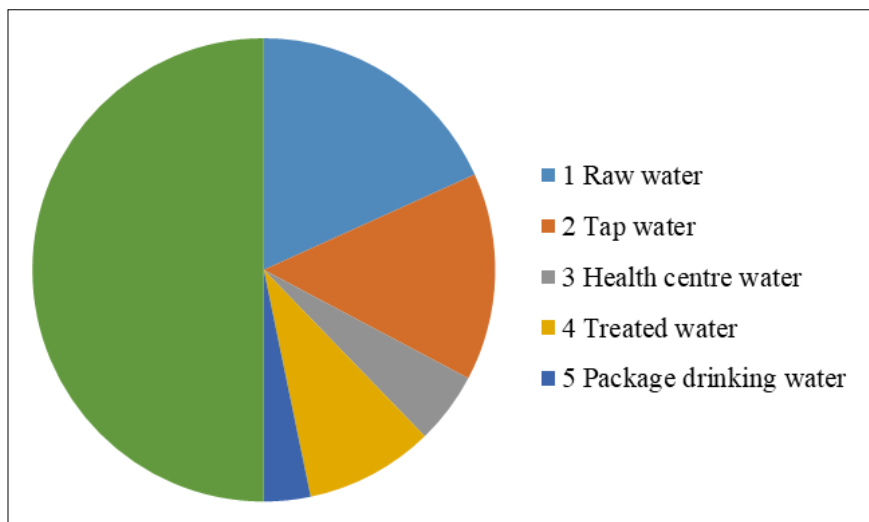


Fig 2: prevalence of *E. coli* in different public drinking water sources of Meghalaya

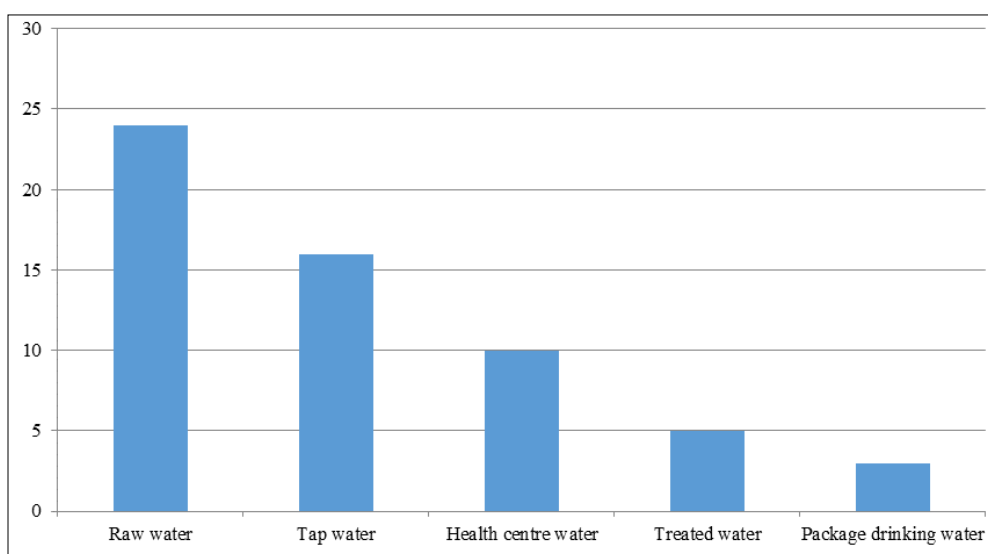


Fig 3: Source wise prevalence of *E. coli* in water

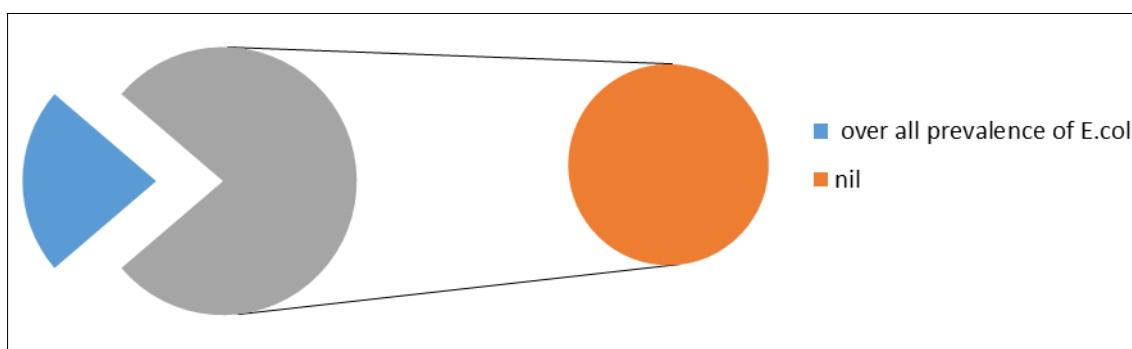


Fig 4: prevalence of *E. coli* in percentage

Discussion

In this study we found the present of *E. coli* in the drinking water in Meghalaya region, out of 200 samples were examined, 58 water samples were found to contain *E. coli*. The highest prevalence was observed in raw water. The presence of *E. coli* in drinking water is direct indication of fecal contamination and water is unfit for direct consumption. Some of the water in Meghalaya was contaminated with fecal bacteria. Due to the present of *E. coli* contamination in drinking water was associated with subsequent diarrhea. Such contamination may cause threat to the people who use the water for drinking. *E. coli* has been widely used as indicator in microbiological quality. The multiple tube fermentation, the tube containing the water samples, showing the gas production, and changing in colors, the MPN was determined from the standard table (McCready table), also the growth were observed on the MacConkey Agar, the presence of dark centered colonies confirmed the presence of *E. coli*.

Membrane filtration, after incubation at 37°C for 24 hours, the filter papers that were placed on the chromogenic coliform agar (CCA) showed dark blue colonies which mean that *E.coli* is presence. *E.coli* has two enzymes and cleaves both chromogenic substances giving dark blue to violet colonies. Microbial contamination of drinking water remain significant threat and constant vigilance is essential. The present of *E.coli* isn't recommended by any Standard Agency.

Conclusion

The presence of *E.coli* in few of the samples is a serious concern. Regular cleaning and monitoring of the water sample by treating, boiling are recommended to use the water sample for safe drinking. The overall prevalence of *E.coli* was observed in water 29%. The present study showed that water sources analyzed were contaminated with bacterial pathogenic surpassing recommended standards.

Government and other stakeholders must also initiate education on environmental awareness including hygienic practices, sanitary way of handling water should be done to help to limit water pollution for safe consumption. As for well water, it should be construct far away from municipal sewage and drainage system.

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