ISSN 2348-313X (Print)
International Journal of Life Sciences Research ISSN 2348-3148 (online)
Vol. 10, Issue 1, pp: (21-25), Month: January - March 2022, Available at: www.researchpublish.com

A STUDY OF ISOLATION AND IDENTIFICATION OF BACTERIA OF KELAVARAPALLI DAM, HOSUR, TAMIL NADU, INDIA

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Abstract: **Water is the basic requirement for survival on earth and serves many functions to man. High dumping of organic and inorganic effluents into the aquatic system causes growth of numerous strains of microorganisms. This is a serious cause of threat to public health. Kelavarapalli dam, in Hosur Krishnagiri district of Tamil Nadu, provides water as a source of irrigation, industrialization and human consumption in the region. A study was therefore conducted during the period of 2016-18 to evaluate the microbiological ecology of the dam waters that was being used for many purposes. Evaluation of microbial pollution was done in terms of the total coliforms and fecal coliforms that habitat the water resource in the region. Our results indicated that water samples obtained from the dam were high in microbial and fecal contamination with high microbial load.**

Keywords: **Pollution, Fecal coliform, Microbial contamination, Total coliform.**

1. INTRODUCTION

Water is an important natural resource. It harbors many phytoplankton and zooplankton species and finds application in many anthropogenic activities like drinking, cooking, fishing, bathing, sporting and agriculture. Unfortunately urbanization and industrialization have disturbed the natural aquatic resources of the earth (Chandra R.S. Singh, and Raj A, 2006). According to an international statistics, waterborne diseases affect almost 250 million people in the world every year with developing countries being at higher risk due to lack of proper sanitary facilities and infrastructure (Sharma C, 2017).

Water is a natural solvent and could facilitate the transmission of many water-borne diseases as Cholera, *E. coli* infections, Dysentery, Typhoid, Vibrio illnesses or Hepatitis A and E infections (Chatterjee S.K, 2010; World Health Organization, 2018). Monitoring the quality of water that reaches consumption of both man and animal could help curb illnesses and strengthen world economics. Water that reaches human consumption should be clean, hygienic and devoid of bacterial, algal, protozoan, viral, helminthal, parasitic worms or fungal contamination (Bureau of Indian Standards, 2012). Identification of microbial indicators of contamination and deriving methodologies to contain their spread could help to sustain the natural aquatic resources of the earth (Krishnan et al, 2007).

Water pollutants could be of many types such as organic, inorganic or biological in origin. Microorganism in water samples can be detected by employing certain microbiological markers that indicate water contamination (Mamun A and Zainudin Z, 2013). Total Coliforms (both fecal coliform/ *E. coli*) can be used as indicators of bacterial pathogens in water quality assessments for waterborne diseases (Prüss-Ustün A et al., 2014). Total coliform bacteria are found ubiquitously in the environment and their presence in drinking water reflects surface contamination mainly of environmental origin. Total coliform show negative respond to disinfection, such as chlorination or boiling of water. Fecal coliform bacteria are

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a subset of the total coliform bacteria that habitat the intestinal tract and the fecal exudates of human and animals (Shittu et al. 2008). Their presence in aquatic systems often hints of fecal contamination, thereby alarming a greater risk of presence of various other sources of pathogens like viruses, helminthes, protozoans and fungi (Singh AK,, 2019).

The presence of coliform bacteria in aquatic reservoirs is a reflection of presence of probably pathogens of innumerable origins, deterioration of microbiological water quality and possible threat of public health to waterborne diseases (Nhinh D et al, 2020; Sharma BK 2014). Therefore in this paper the aim of the study was to evaluate and assess the microbiological ecology of water samples from Kelavarapalli dam, of Hosur, Krishnagiri district of Tamil Nadu with the intention to evaluate the water quality and identify the degree of total coliforms and fecal coliforms that habitat the water resource in the region. It is important to evaluate water quality of the dam as it provides a source of irrigation, industrialization and human consumption in the region.

2. MATERIALS AND METHODS

Study Site and its Environmental Conditions

The present study was carried out in Hosur town which falls under the northwestern region of Krishnagiri district of Tamil Nadu. It is bordered on either side by both Karnataka and Andhra Pradesh. Krishnagiri district has a pleasant climate with dry atmospheres. The dry season lasts from January to March, summer falls between April and May, southwest monsoon season starts from June to Sept and from October to December is the northeast monsoon season. The major water supply towards Hosur taluk comes from river Ponnaiyar that basically originates in Nandidurg hills in Karnataka, where it is referred to as Dhakshina Pinakini. Travelling from Devanahalli and Hoskote taluks of Karnataka, Ponniyar River enters Tamil Nadu state near Bagalur village of Hosur taluk. It has a total population of 245,354 with population density of 3,400/km^2 (8,800/sq mi). Hosur receives rainfall from both the northeast and the southwest monsoons. It has an average rainfall of 822.4 mm and month wise distribution is around 18.7 mm during January -February, 182.5mm - March to May; 349.8 mm - southwest monsoon and 271.4 mm during the northeast monsoon. Hosur falls under a heavy rainfall region as shown in **Fig 1.**

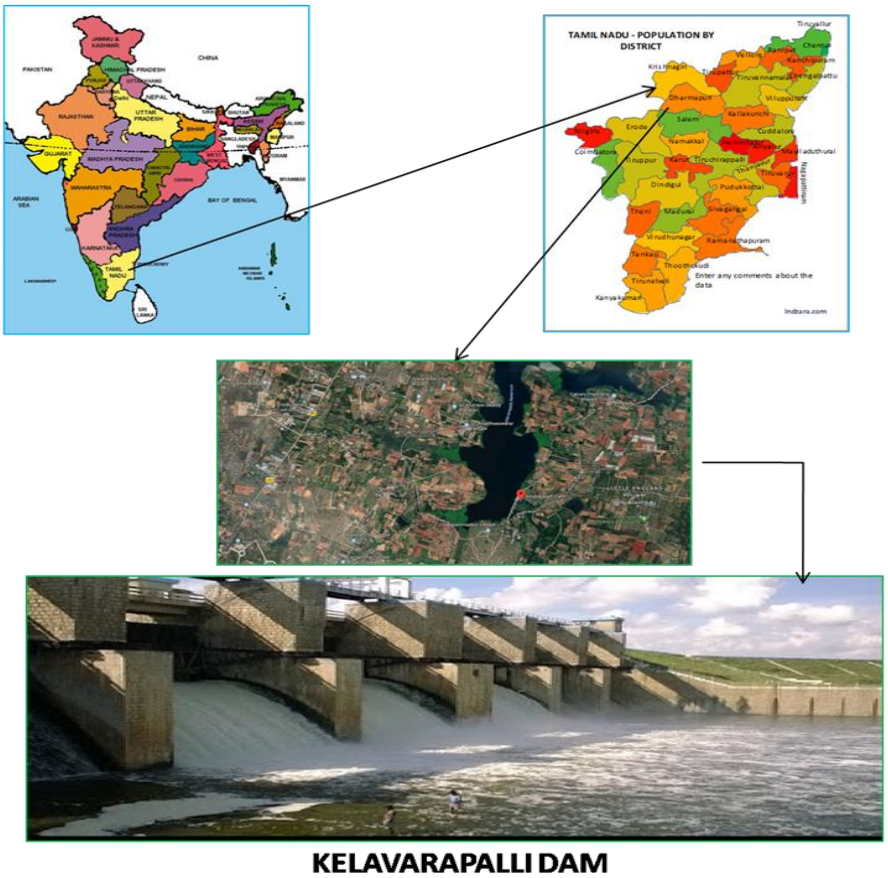

Fig. 1: Location of Kelavarapalli dam (Hosur town of Krishnagiri district of Tamil Nadu)

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Sample collection and analysis

Water samples were collected at monthly intervals during the period from January 2016 to December 2018. Samples were collected in sterilized borosilicate glass stopper bottles and stored at a temperature between 6-10^{o}C in refrigerator. Coliform quantification was done using membrane filter technique as followed by standard protocol (APHA, 1985). Briefly a known volume of water sample was passed through a special sterile filter made of nitrocellulose acetate and polycarbonate with a thickness of 150µm and 0.45µm diameter pore. When the water samples are filtered bacteria in the sample are trapped on the surface of the filter. The filter was carefully removed and placed in a sterile petri plates containing the solidified media and incubated for 20-24 hours at 37^{0}C and 44.5 ^{0}C for Total coliform and Fecal coliform respectively. Bacteria that produce a red colony with metallic (golden) sheen within 24 hours of incubation at 37^{0}C on the Endo-type media are considered members of the coliform group (total coliform). The sheen may cover the entire colony or may appear only in a central area or on the periphery.M-Endo and M-FC media were prepared following published protocols from (Atlas R. M. and Bertha R, 1997).

3. RESULTS AND DISCUSSION

Water can be found abundantly in oceans, lakes, rivers or ponds. Groundwater can also be accessed in the form of well water or through dug up tube/bore wells. However urbanization and industrialization have taken a greater toll on the aquatic bodies turning these water resources into dumping grounds receiving contaminations from domestic sewage, agricultural runoffs and effluents from industries and agriculture (Singh and Mathur, 2005). High dumping of organic and inorganic effluents into the aquatic systems make them a ripe hub for growth of various strains of microorganisms that cause a serious threat to public health (Singh AK et al., 2018). Such scenarios therefore warrant regular screening of water bodies (river, lakes, ponds, dams, storage and tanks) that usually end up collecting the dumping either as direct disposals or as runoffs during rainy seasons, resulting in water pollution (Sharma BK 2014). The results of our study were a compilation of three years data (2016-18) and point out that observations made for Kelavarapalli Dam, identified presence of Total and Fecal Coliform bacteria.

Evaluation of Total Coliforms

During 2016, Kelavarapalli dam registered highest coliform count of (480 CFU/100 ml) during the month of June and lowest was observed during the month of December with a count of (46 CFU/100 ml). In 2017 the highest coliform concentration in Kelavarapalli dam was during the months of May-July with a value of (360 CFU/100 ml) and lowest was observed during the month of December (34 CFU/100 ml). Lastly the 2018 data for Kelavarapalli dam showed highest coliform count of (340 CFU/100 ml) during the month of August and lowest was observed again during the month of December with a count of (65 CFU/100 ml) as shown in **Fig.2**

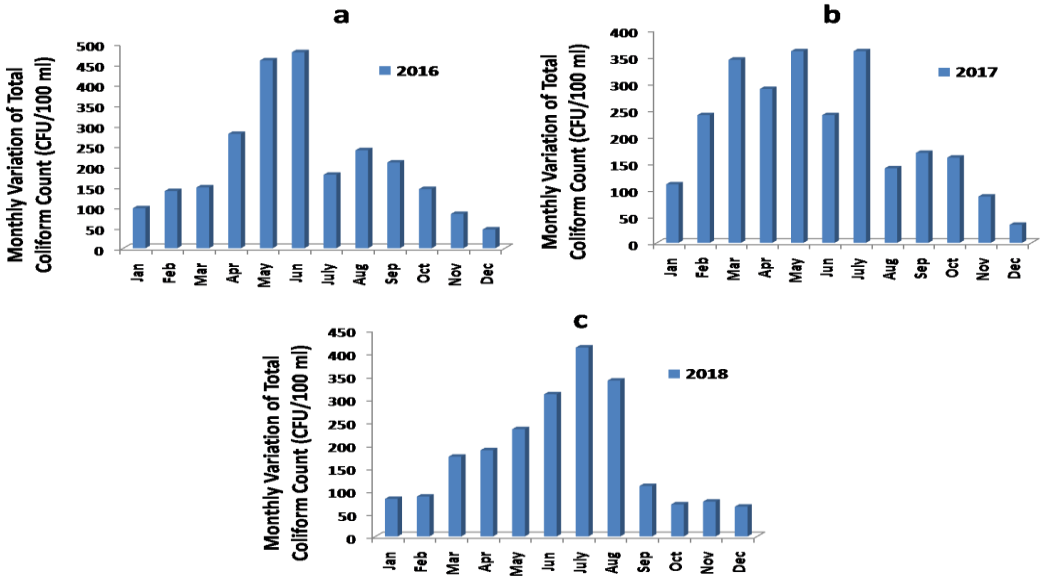

Fig. 2: Monthly variation of the Total Coliforms in Kelavarapalli dam during Jan 2016 to Dec 2018

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Evaluation of Fecal Coliforms

During 2016, Kelavarapalli dam registered highest fecal coliform count of (348 CFU/100 ml) during the month of August and lowest was observed during the month of December with a count of (61 CFU/100 ml). In 2017 the highest fecal coliform concentration in Kelavarapalli dam was during the months of June with a value of (396 CFU/100 ml) and lowest was observed during the month of December (41 CFU/100 ml). Lastly the 2018 data for Kelavarapalli dam showed highest fecal coliform count of (388 CFU/100 ml) during the month of August and lowest was observed again during the month of February with a count of (45 CFU/100 ml) as shown in **Figs. 3**

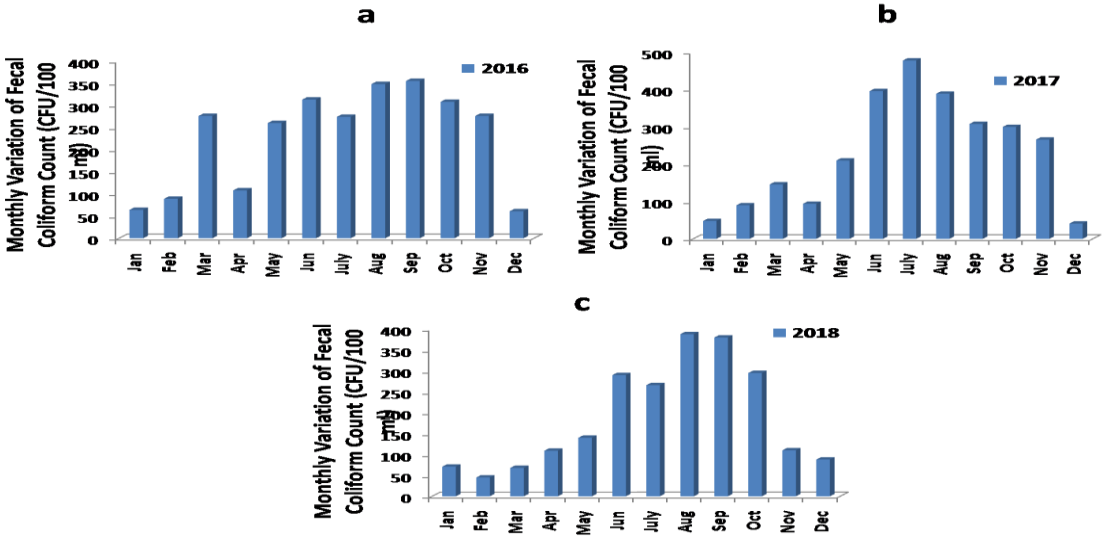

Fig. 3: Monthly variation of the Fecal Coliforms in Kelavarapalli dam during Jan 2016 to Dec 2018

Many authors have investigated biological pollution in water bodies, in the past. Suthar et al., 2009; drew an association between urbanization and industrial discharge to the occurrence of metal spriking in water and sediments of Hindon River in India. Shariq, et al., 2016 also studied the coliform count in water sample from different points of Moradabad University in India. Francis et al., 2015 studied the factors and notions that decided the quality of water fit for drinking in rural south India. Edokpayi et al., 2018 further evaluated the microbiological and physicochemical parameters of drinking water in Nzhelele river in South Africa. Likewise Bisi-Johnson et al., 2017 studied household source and stored waters for comparative physicochemical and microbiological qualities in some selected communities in southwestern Nigeria. Martin et al., 2016 studied the role of coliforms in dairy foods industry with special focus on unhygienic indications.

Our results from 2016-18 for Total Coliform highlight that the water quality of Kelavarapalli dam was deteriorated more during the monsoon as compared to the winter season. This may be due to higher levels of water and run offs received from surrounding areas and hint towards higher inorganic contamination which may be due to more industries in the area. Similarly a survey of the Fecal Coliform data from 2016-18, again highlight a higher and more deteriorated water quality of Kelavarapalli dam during the monsoon as compared to the winter season as shown in **Fig. 4**.

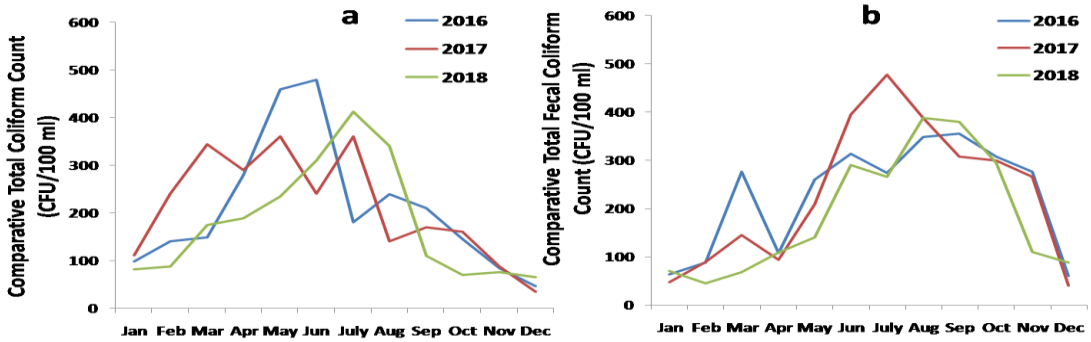

Fig. 4: Comparison of Total Coliform and Fecal Coliforms in Kelavarapalli dam during Jan 2016 to Dec 2018

Because the origins of fecal coliforms are more specific than the origins of the more general total coliform group of bacteria, fecal coliforms are considered a more accurate indication of animal or human waste than the total coliforms. Fecal coliform bacteria are present in the fecal exudates of human and animals and could hint the presence of other sources of pathogens namely viral, protozoan. Presence of Total coliform in general in not as alarming as Fecal coliform count that not only hint towards fecal presence from anthropogenic but also from animals. What makes them a cause of greater health concern in the interest of the public eye is that fecal coliform could act as a basin/hub for the growth of various other contaminants from various other origins(Casanova LM and Sobsey MD, 2016).

Conclusively it can be said that survey of Kelavarapalli dam from 2016-2018 highlight that it is highly deteriorated hinting toward high eutrophication, severe contamination and ecological threat in the dam. Both rural and urban anthropological practices need to be improvised to salvage the lakes and rivers from malpractices.

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