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Impact of MPN of *Coliforms* on the wholesomeness of drinking water.

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ABSTRACT

The study was carried out with one time examination of *Coliforms* available in drinking water like sources and storage points. The study was carried out in three rural habitants of Coimbatore, Tamilnadu, India with an objective of analyzing the water as a suitable one for drinking or not**.** Descriptive statistics ends up with both numerical and graphical procedures in-order to summarize the data in a clear and easy understandable way. It helps in simplifying the vast data in a clear and most sensible way. Central tendency will aid in the estimation of the center of distribution of values The three habitants identified for this study was Ettimadai, Malumichampatti and Edayarpalayam. The study was carried out once in three months for three times. (Sep – 13 to Nov – 13), (Dec – 13 to Feb – 14) and March – 14 to May -14. The P value (Probability) sates 0.05 as irrespective of the habitants studied. This study was done by undergone with MPN three tube method. Based on the number of positive detected *Coliforms* the drinking water sample the values were computed. This study suggests irrespective of village, population, source and storage, the drinking water was unsuitable for drinking as per International Standards. The earlier reports will states based on the presence of number of Coliforms, the water shall either suitable or unsuitable for drinking. This study will helps the policy makers, young researchers currently working on *Enterobacteriaceae.*

Keywords: Coliforms, Drinking water, MPN, Central tendency, P Values.

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INTRODUCTION

Water shall consider as the essential part of the life in the planet Earth. The basic need of humans for their survival is air, water and food. 3/4th of the Earth is covered by water. 97% of the water is unusable as they are being seawater and hence the available water for drinking on Earth is only 3%. This water is too stacked with glaciers, ground water and pond water etc. Hence, increase in population the drinking water gets limited and it can't be replaceable. We are hence dependent on the scarce quantity of the drinking water available. Due to increased industrialization and human population, the demand for water supply has also been increased [4]. Mostly water borne diseases were responsible for over 28 billion disease episodes annually in developing countries [11].

World water day is marked on 22 march of every year. The major issue in India on water consumption is clean drinking water, sanitation, health and hygiene. To cope up with these issues and keeping in mind about the future scarcity of drinking water, the Government has undertaken several initiatives such as Swachh Bharat Abhiyan, Clean Ganga project to create an enabling environment for the access of safe drinking water [7]. The role of Union Government had played a important role by increasing the awareness of increased household toilets as 9 % in year 1991, 22% in the year 2001 and 32.7 in the year 2011 [8]. Under Swachh Bharat Abhiyan scheme the goal is now being pre-poned to make India Open Defecation free (ODF) by 2019 in such a way by construction of individual, Cluster and community toilets and villages will be clean and should supplied with clean and safe drinking water.

Drinking water in Coimbatore is supplied through street taps and taps inside the dwellings, depending upon the location of the villages. The water is treated at the source and supplied through pipelines. Even though the water is treated at the source there is a likely possibility of drinking water getting polluted through several ways such as rain / sewage water entering through broken pipelines and thus polluting the treated water before it is being distributed through street taps or through taps located within households. Street taps are not properly maintained and there are several ways by means of which possible contaminations are likely to occur. Water quality assessment generally involves analysis of physio-chemical, biological and microbiological parameters this inturn reflects on abiotic and biotic status of the ecosystem.

MATERIALS AND METHODS

Study Area

The study was conducted in three rural habitants of Coimbatore district, Coimbatore, Tamilnadu, India. The study area was selected based on the questionnaire and the study area map as **(**Fig. 1 and Fig. 2**).** Geographically, Coimbatore islocated at 11.01^{o}; 76.97'. The study areas Ettimadai (Station 1) located at 10.98^{o}; 76.90', Malumichampatti (Station 2) is located at 10.98^{o}; 76.96' and Edayarpalayam (Station 3) located at 11.03^{o}; 76.92' of latitudes and longitudes respectively.

One time examination of *coliforms* of sources of drinking water ST and TWH distributed in all three villages were carried out with regular interval of three months (Sept – Nov 2013, Dec – 2013 – Feb 2014 and March 2014 – May 2014). Similarly one time examination of MPN of coliform for all the storage points like 10 street taps (ST) and 30 street tap water stored (STS), 30 tap water inside the house (TWH) and 30 tap water stored in the house (TWHS) in three villages were carried out during the period of September 2013 to May 2014.

The total human population of district is 2,136,916 based on 2011 census. Ettimadai human population ranges at 9,352, Malumichampatti human population ranges at 12,936 and Edayarpalayam human population is at 6,612 as the whole the study area population consists of 28,900. (www.census2011.co.in). The study area percentile stands around 1.36% of the Coimbatore district population. Nearly 78% of the total population resides in rural areas. According to agro-ecological-zone classification Coimbatore district is considered as Western Zone with the mean rainfall as 718 mm and 45 rainy days. The monthly mean minimum temperature is 19 ^{o} C in January and 24 ^{o} C in May. (Agri.dir.TNAU).In this district the pond water is the major sources of potable water.

Sample Collection

A total of 360 water samples were collected from the residential localities of 3 different villages / towns and 150 stool samples were collected from the suspects of diarrhoea with the age group of children is 0 – 5, apparently healthy normal kids were considered as control group in study areas (Station 1-3). i.e. Ettimadai, Malumichampatti and Edayarpalayam. All these samples were the basis of study materials for the epidemiological study of *Coliforms* and related pathogens. The sample was collected by disinfecting the metal taps by flaming them for 30 seconds approximately (Fig 3). Few households were not accepted this flaming method. In their households, external fittings were removed from the tap. Grease and Slime etc was also removed using iso – propyl alchol wipe. The tap was turned on and the water was allowed to run waste, at uniform flow rate for 5 minutes. This was done in order to remove any debris, sediment and biofilm that may available in within the tap and its associated pipe lines.

The flow of the water from the tap is adjusted to a slow and steady flow rate. This is done to avoid the splashing of water at any time during the sample collection procedure from the tap. If change in the flow rate is experienced then the new container was used. After the temperature of tap gearing back to normal before flaming the container cap was removed and hold it on the left hand and the container (Supplier AMETEK) was kept little below the tap (Fig 4). Precaution shall take; neck of the container does not touch the tap or the other contaminating sources nearby. The container should not rinse and the container cap should not place on any surface. Approximately 75 % of the container was filled with water and the remaining left as blank/ unfilled. The samples were collected in a sterile container by following the method described by [4]. To avoid further contamination disposable gloves washed with 1 N HCl was worn during the procedure of sample collection. Once the sample was collected, seal the container immediately with the cap taking care of not touching the neck of the bottle. The container and its contents should be kept cool by placing it in an insulated cool box and finally transferred to the lab. Generally the microbiological characteristics of the sample may gets changed significantly while storage, even for relatively short periods of time. Samples collected using sterile containers were brought to the laboratory in portable ice chest maintained at 4°C and analyses were done within 2-4hrs of collection. To detect the presence of coliforms in the samples Most Probable Number (MPN) technique was used [1]. The microorganism removal efficiency has been studied extensively and the results are very encouraging to offer a technology at an affordable price tag to the third world countries, where the water borne diseases are a threat to their everyday life [2]. There is a correlation between the PH, Nanotubes and removal of fluoride [5].

RESULTS

Irrespective of drinking water was considered in this study as having P value as 0.05. The tables 1,2 and 3 indicates the P value is higher than 0.01. As, the hypothesis of P value is either 0.05 or less than 0.005 was considered as positive results. As, the result indicates the water irrespective of source is having *Coliforms.* Hence the study concludes with that most of the drinking water we are using is heavily polluted with bacterial contaminants.

Table 1.Incidence of water sample screening – MPN method with reference to month and Edayarpalayam

S.No	M/Y	SS	ST	STS	TWH	TWHS
1	S13	120	10	10	10	10
2	D13	120	10	10	10	10
3	M13	120	10	10	10	10
4	Total	360	30	30	30	30
5	Mean		36	38	15	22
6	SD		12.5	25.6	11.1	23.5
7	Median		36	32	11	19
8	P value		0.05	0.05	0.05	0.05

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Table 2.Incidence of water sample screening – MPN method with reference to month and Ettimadai

S.No	M/Y	SS	ST	STS	TWH	TWHS
1	S13	120	10	10	10	10
2	D13	120	10	10	10	10
3	M13	120	10	10	10	10
4	Total	360	30	30	30	30
5	Mean		33	40	17.5	15
6	SD		8.01	8.13	13	13
7	Median		32	32	10	35
8	P value		0.05	0.05	0.05	0.05

Table 3.Incidence of water sample screening – MPN method with reference to month and Malumichampatti.

S.No	M/Y	SS	ST	STS	TWH	TWHS
1	S13	120	10	10	10	10
2	D13	120	10	10	10	10
3	M13	120	10	10	10	10
4	Total	360	30	30	30	30
5	Mean		22	29	38	10
6	SD		9.0	3.35	11.4	9.30
7	Median		32	8	14	32
8	P value		0.05	0.05	0.05	0.05

* M/Y denotes month and year, SS – Samples studied, ST – Street tap water, STS - Street tap water at storage, TWH – Tap water inside th home, TWHS – Tap water inside the home at storage.

Fig 1. Study area map of Edayarpalayam

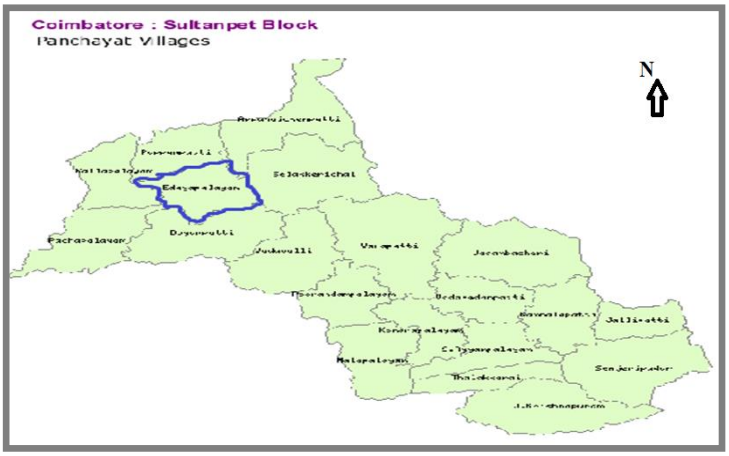


Fig 2. Study area map of Ettimadai and Malumichampatti

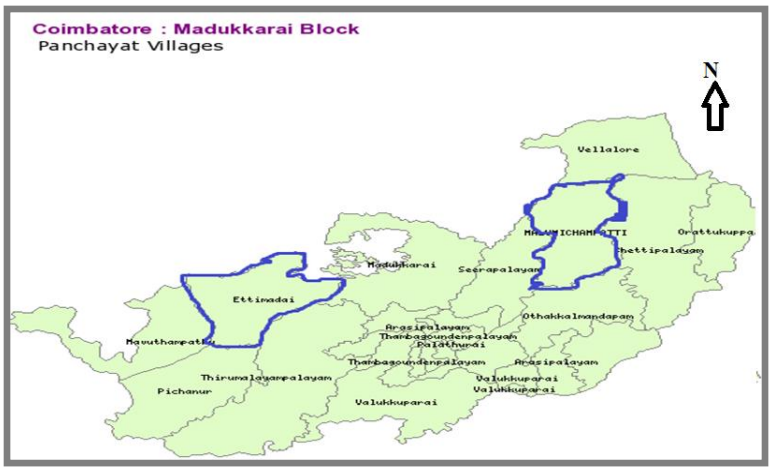
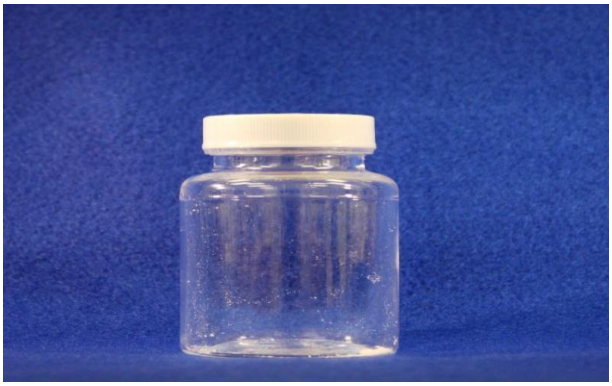


Fig. 3 Gas Butane flame Gun

Fig. 4. Water sample collection Container



DISCUSSION

A convergence of events and opportunities makes this a propitious moment to estimate the magnitude of the global burden of disease and death caused by shigella [7]. Most of the water borne disease was bacterial mediated. For instance water borne diseases, exclusive of S*higella spp* causes approximately 600 000 deaths worldwide annually. Two-thirds of all cases and most of deaths occur among children under 10 years of age [3]. Shigellosis remains a common gastrointestinal disease in developing countries. In the last 50 years of report it was found that the shigella species had become as a resistant to the common antibiotic drugs by empowering themselves. Frequent attempts have been made by different peoples to innovate or discover a drug which will be able to cure the shigellosis disease more efficient than the existing drugs. Botanist, microbiologist, pharmacologist all over the world today are trying to find effective drugs against various pathogens. Recently researchers have found that microbes are sensitive to herbal based drugs than any other drugs. In this current study an attempt was made to isolate the shigella sp. and a design for an effective drug from the herbal source. The extract evinced antibacterial activity on all the tested organisms viz. *Staphylococcus aureus, Pseudomonas aeruginosa, Proteus mirabilis, Enterococcus faecalis and Escherichia coli* at the concentration ranged from 50- 400µg/ml as assayed by disc diffusion. *S. amaranthoides* also caused a significant (pSpheranthtus amaranthoides that can be used as a therapeutic agent [10].

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