

## Assessment of Groundwater Pollution Based on Bacteriological Study in Thrissur City, Kerala, India

R. B. Binoj Kumar and Anet Panakkal

Department of Geology, University of Kerala, Kariavattom, Trivandrum, Kerala

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### ABSTRACT

This study is intended to assess the likely contamination of groundwater in the shallow aquifer, owing to the gratuitous invasion of microorganisms in Thrissur Corporation. One of the ailing effects of urbanization is water pollution due to the incursion of faecal coliforms into groundwater resources, predominantly cramped to open wells. The outcome denotes that the water is habitually contaminated and the degree of contagion is elevated in the vicinity of temporary shelters of migrant workers. Predictable rationale for this is the admixture of human excreta and animal waste with the groundwater. Thus, insistent steps are recommended to the Corporation officials to deal with this distress at once to guarantee provision for hygienic drinking water.

Pollution occurs when waste products of other substances change chemical or biological characteristics of water and degrade water quality so that the animals, plants and the human use of the water are restricted. Pollutants include plant nutrients, bacteria, viruses, pesticides, herbicides, heavy metals and other toxic chemicals. In the present study an attempt was made to assess the extent of groundwater pollution owing to bacteriological contamination. Bacteriological analysis is important for detecting biological pollution of groundwater. Examination of drinking water provides information on the status of pollution. Many waterborne diseases like cholera, typhoid and jaundice are spread by consumption of unhygienic water. Most of these diseases causing bacteria are of faecal origin and the faecal contaminants could reach groundwater reserves from many pathways. Important sources include failed septic systems, leaking sewer lines and cesspools.

The study area falls in the geographic coordinates of 10°26'24"-10°35'16" N and 76°8'50"-76°18'36" E of Survey of India topo sheet. The predominant rock type encountered in the study area is charnockite and the area is by and large covered by lateritic soil. The north-western portion of the study area is occupied by wetlands and this zone obviously acts as a natural recharging site. Hence, any pollution taking place in this region will seriously affect the freshwater aquifer systems. The water sampling was done in the month of August 2011, following the customary guidelines. The density of faecal coliforms in groundwater samples was determined by most probable number (MPN) method using multiple tube fermentation technique following standard pro-

cedures (APHA 1995). In order to get a clear picture of the incident pollution in the study area, sampling locations were categorized into four zones namely near residential areas, near hospitals, near institutions and near workplaces (which include settlement of migrant workers). This classification will facilitate to review the divergence in the rigorousness of pollution. From each defined category, 5 samples were collected with a total of 20 water samples (Fig. 1) ensuring justifiable spatial distribution.

Analytical results (Table 1) show that every sample from each four zones confirm the incidence of faecal coliforms, which presume that the water is harmful for consumption. If the water samples authenticate faecal coliform count (BIS 1991), it assign incidence of faecal contamination. While probing the classified four zones, samples from the locations near to hospitals and institutions show comparatively low concentration of 21-48 and 7-48 MPN of faecal coliforms/100 mL correspondingly, at the same time as compared to the other zones. This may be due to the properly planned and better managed sewage systems and other sanitation facilities provided. Contrary to the other situations, samples from residential areas and workplaces of the migrant workers show elevated levels of contamination. The locations in the residential areas (1, 3 and 4) are surrounded by a cluster of toilets near the wells, which are not properly maintained and their latrine pits are unscientifically constructed. It is unfortunate to note that in those places most of the inhabitants use open well water for drinking. Whereas, location 2 is confined to the Corporation's garbage dumping yard, here irrational waste management practice is responsible for the contamination.

Table 1: Bacteriological analysis data (MPN of faecal coliforms/100 mL) of groundwater samples from Thrissur.

Residential Areas		Near Institutions		Near Hospitals		Work Places	
Location	MPN	Location	MPN	Location	MPN	Location	MPN
(1) Patturakyal	64	(6) Vimala college	7	(11) Heart Hospital	28	(16) Kokkali	150
(2) Lalur	75	(7) Ollur	39	(12) Elite Hospital	23	(17) Poothole	120
(3) Kanattukara	93	(8) Kuriachira	20	(13) Mission Hospital	21	(18) Kalathodu	210
(4) Nallenkara	120	(9) Ayyanthol	28	(14) Metro Hospital	11	(19) Valarkavu	93
(5) Panamukku	39	(10) Anjeri	48	(15) Dhanya Hospital	39	(20) East fort	240

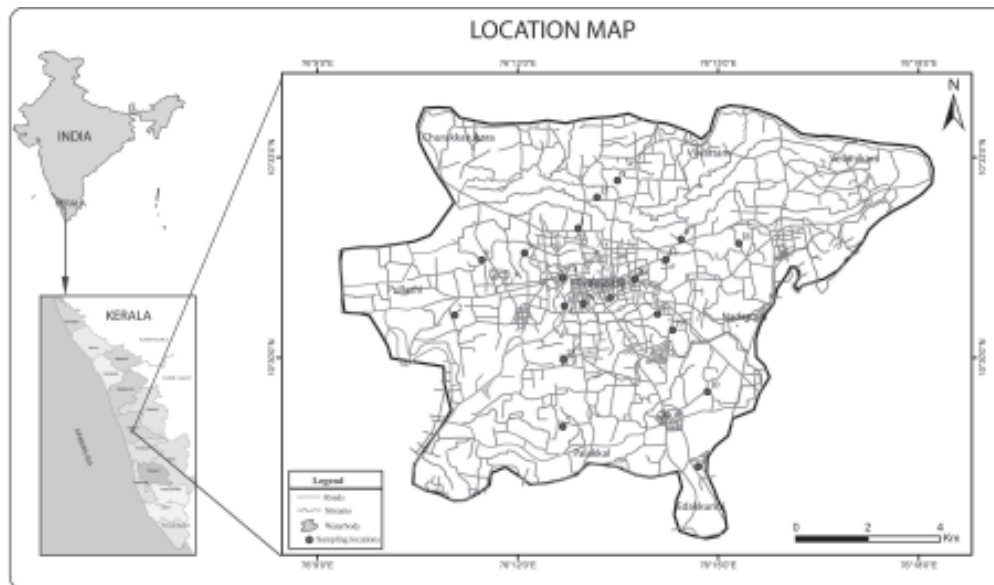


Fig. 1: Location of sampling wells.

Near the workplaces, faecal coliform count is 93-240, which is highest among the four classified zones. In locations 16, 17, 18 and 20, pollution rates are marginally high. The reason for this phenomenon is due to the unhealthy sanitary practices followed by the migrant workers who reside in tents and other temporary shelters, clustered in the vicinity of open wells. Presence of sandy soil in this region accelerates the percolation of contaminants, creating an easy pathway. However, in location 19, rate of pollution is lesser, that is the only place where workers are not staying at the site. The alarming situation is that the inhabitants do use this contaminated open well water for drinking and other domestic purposes.

This study reveals that the groundwater curbed to the residential areas and near the workplaces is decidedly unhygienic. The Corporation authorities should bring in apposite measures to purify the drinking water and should also create

consciousness among the people and the owners of the workstations to offer sterile living conditions to the working class. It is high time to provide health card and proper housing amenities to migrant workforce so as to check possible outbreak of communicable diseases.

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