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Groundwater Quality Assessment Near Municipal Solid Waste Dumping Site at Mudavoor, Muvattupuzha

Nivya Mary Abraham[1], Jerald Baby Joseph[2], Jinu John[2], Manu Biju[2], Sharon Philip[2]

[1]*Assistant Professor, Dept. of Civil Engineering, Viswajyothi College of Engineering and Technology, Kerala, India*
[2] *B-Tech Student, Dept. of Civil Engineering, Viswajyothi College of Engineering and Technology, Kerala, India*

Abstract – *Rapid urbanization and improper disposal of municipal solid wastes have led to contamination of groundwater near the dumping sites. Proper disposal and treatment methods are not employed to prevent contamination of water and soil. The present study explored the municipal open dumping site of Mudavoor impacts on ground water quality. Five spots were selected for water sampling at specific distances from the sites in the study area. Then the samples were examined for different parameters.*

Keywords: **Solid Waste, Physio-chemical parameter, Ground water contamination**

1. INTRODUCTION

Rapid urbanization and fast growth rate of population will contribute to increase in MSW in India. It is anticipated that the population of India will be about 1,823 million by 2051 and approximately 300 million tons of MSW will be produced per annum. Improper disposal of these solid wastes will contaminate the groundwater. The leachate from this dumping sites will penetrate into the groundwater and will affect the quality standards of drinking water.

The present study focus on the contamination of groundwater near the MSW facility of Muvattupuzha Municipality.

1.1. Solid waste

Solid waste means any garbage, refuse, other discarded materials including solid, liquid, semi-solid, or contained gaseous material, that are produced from industrial, commercial and from household activities. Examples of solid waste include waste tyre, metal scrap, latex paints, furniture, toys, garbage, appliances, empty aerosol cans, construction and demolition debris, asbestos, organic matter etc.

1.2. Solid waste leachate

Leachate generation near the municipal solid waste facility threatens the quality of groundwater. Leachate is a liquid that extracts the dissolved and suspended particles from a landfill. Leaching mainly occurs during flow of water through the wastes.

2. STUDY AREA

MSW facility of Muvattupuzha municipality is located in Valakkuzhi which is a residential area adjacent to the traditional agricultural area called Kadathy fields. The facility is a small establishment with a small segregation/ processing shed without any scientific landfills, weighing scale and other structures for processing compost or recyclables.

Fig-1. Google image of Valakuzhi MSW Facility

2.1. Sampling locations

Five samples were collected from wells from different locations in and around the MSW facility at different distances for analysis. The samples were collected within 1 km radius of the facility. The latitude and longitude of the area was also determined using google maps. Locals suggested possible contamination of the water.

Table 1. Sampling locations

Sample	Latitude	Longitude
S1	9.994660	76.5597880
S2	9.993170	76.5579520
S3	9.9948150	76.5614860
S4	9.9919220	76.5611830
S5	9.9895250	76.5619270

3. WATER QUALITY PARAMETERS

Various physical and chemical characteristics of the water was tested. The physical parameters include pH and colour. The chemical parameters include alkalinity, turbidity, COD, DO, iron, chlorides, TDS.

3.1. Significance of parameters

3.1.1. pH

pH indicates the acidity or basicity of water and shows the hydrogen ion concentration. The solubility and biological availability of chemical constituents like nutrients and heavy metals present in water can be determined by pH of water.

3.1.2. Total dissolved solids

The total dissolved solids concentration of good quality drinking water should exceed 500 mg/L. This limit was set on the basis of taste thresholds. Continuous use of water with high TDS might cause weakness, scouring, reduced production, bone degeneration and death.

3.1.3 Dissolved oxygen

Oxygen present in dissolved form in water is called DO.It is a factor that determines whether biological changes are brought about by aerobic organisms. Acceptable limit of dissolved oxygen as per IS 2296-1982 is 4 mg/L.

3.1.4 Alkalinity

Alkalinity will influence the chemical and biological processes in water and waste water.

3.1.5 Turbidity

Material causing water to be turbid include silt, clay, finely divided inorganic and organic matter, soluble colored organic compounds, algae, plankton and various other microscopic organisms. Turbidity will serve as shelter and food for pathogens. Regrowth of pathogens in the distribution system will be promoted if the turbidity is not removed, leading to waterborne disease outbreaks, which have caused significant cases of gastroenteritis throughout the world.

3.1.6. Chlorides

Chloride toxicity has not been observed in humans except in the exceptional case of impaired sodium chloride metabolism. Healthy human beings can tolerate the intake of large quantities of chloride if there is a sufficient intake of fresh water. Chloride increases the electrical conductivity of water and also its corrosivity. Chloride concentrations in excess of about 250 mg/litre is not preferred and will result in a taste difference in water.

3.1.7. Iron

High value of iron will promote bacterial growth in water. Aeration of iron containing layers in soil can affect the quality of both groundwater and surface water. Dissolution of iron might take place as a result of oxidation and decrease in pH.

3.1.8. Chemical oxygen demand

Higher COD values in the sample will show that there is larger amount of oxidizable matter in the water sample and will reduce the DO levels.

4. RESULTS AND DISCUSSIONS

The collected samples of water were free from odour and colour. The chemical tests showed that some parameters were above permissible limits.

Table 2. Test results for Ph

pH (Permissible value=6.5-8.5)	
Sample No	Value
S1	5.41
S2	5.46
S3	5.86
S4	5.56
S5	5.91

Table 3. Test results for TDS

TDS (Permissible value=500 mg/L)	
Sample No	Value(mg/L)
S1	768
S2	698
S3	1014
S4	1294
S5	587

Table 4. Test results for DO

DO (Permissible value=4 mg/L for aquatic	
Sample No	Value(mg/L)
S1	7.4
S2	5.9
S3	7.8
S4	6.3
S5	7

Table 5. Test results for Alkalinity

Alkalinity (Desirable limit=200mg/L)	
Sample No	Value(mg/L)
S1	20
S2	26
S3	26
S4	30
S5	22

Table 6. Test results for Turbidity

Turbidity (Permissible limit=5 NTU)	
Sample No	Value(NTU)
S1	25.5
S2	18
S3	16.9
S4	16
S5	16.2

Table 7. Test results for Chlorides

Chlorides (Permissible limit=250 mg/L)	
Sample No	Value(mg/L)
S1	15.99
S2	11.99
S3	14.49
S4	13.49
S5	11.49

Table 8. Test results for Iron

Iron (Permissible limit=0.3 mg/L)	
Sample No	Value(mg/L)
S1	0.1
S2	0.64
S3	0.58
S4	0.41
S5	0.21

Table 9. Test results for COD

COD (Permissible limit=250 mg/L)	
Sample No	Value(mg/L)
S1	148
S2	428
S3	208
S4	936
S5	539

The test results showed that the levels of pH, COD, TDS, iron, turbidity are not within the permissible limits. This indicate contamination of groundwater near the area. This will result in health problems to the nearby households. The reasons for this may include improper segregation, lack of control on leachate flow, improper lining given to the dumping site.

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