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Evaluation of Ground Water in Dumping Sites near Municipal Solid Waste at Jaunpur City

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ABSTRACT: *The most common and forgotten cause of water pollution is the uncontrolled discharge of municipal solid waste. The infiltration of water with rain, the water already present in the waste or the water generated by biodegradation causes leachates to leave the dump laterally or vertically and penetrate into the groundwater causing pollution. Ten samples of groundwater collected during the 2016 rainy season from the study region and the samples were analyzed for various physical and chemical properties. During the study, it was found that the total dissolved solids range from 546 mg / L to 907 mg / L and is compared to the allowed limits. Therefore, the best accepted option is to avoid the possibility of contaminating groundwater resources.*
KEY WORDS: *municipal solid waste, groundwater, pollution, leachate, pollution*

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I. INTRODUCTION

The rapid increase in population and the change in lifestyle in India have led to a significant increase in the production of municipal solid waste (MSW). It includes domestic and commercial waste representing a relatively small part of the total solid waste stream in developed countries. The accumulation of a large amount of waste can create different problems for populations inhabited. Population growth has helped to increase the quality and variety of waste. The collection, transport and handling of waste must also be treated appropriately; otherwise the waste creates a series of problems, many of which are related to human health and the environment [1, 2].

Most of MSW's management consisted of the direct elimination of open landfills. Unfortunately, it is noted that developing countries where waste is discharged directly in unscientific and uncontrolled ways can be harmful to the urban environment. MSW leachate contains a variety of chemicals such as detergents, inorganic chemicals and chemical compounds and complex metals [3].

These components are inherently very toxic to the environment and, moreover, the uncontrolled microbial action may result in the release of more toxic elements that were not present in free or reactive form in the waste [4, 5]. During the infiltration of water through rain, the water already present in the waste or the water generated by the biodegradation causes leachates to leave the landfill laterally or vertically and penetrate into the groundwater causing pollution [6, 7]. In recent times, the impact of leachate in aquifers and other water resources has attracted much attention due to its immense environmental importance. The migration of leachate from landfills or landfills and the release of pollutants from sediments (under certain conditions) represent a high risk for groundwater resources if not managed correctly [8].

Groundwater is an important water resource in urban and rural areas of India, but water transported by pipelines is also available in cities. The inhabitants of the rural areas depend mainly on manual excavation wells for the supply of drinking water, as the flows usually dry up during the summer season. This useful resource is threatened by the contamination of the human lifestyle that manifests itself with the low level of hygiene practiced in developing nations [9, 10, 11 and 12]. Groundwater protection is a major environmental problem because the importance of water quality in human health has aroused great interest lately [13, 14, 15, 16, 17, 18, 19, 20 and 21].

Recent research in the city of Jaunpur has concluded that it is the high rate of exploitation of groundwater that the recharge, the inadequate disposal of solid and liquid waste is the main cause of the deterioration of the quality of groundwater. Therefore, it is necessary to look for some useful indicators, both chemical and physical, that can be used to monitor the functioning and performance of drinking water.

Therefore, the present investigation deals with the assessment of the quality of groundwater (drinking water) near the landfill of solid urban waste in the city of Jaunpur.

II. MATERIALS AND METHODS

A. Survey and Sample Collection

The survey was conducted during the months of August, September and October (rainy season) of 2016 of the ten landfills around the city of Jaunpur. All samples were collected near the MSW landfills and stored at 4 ° C until analysis.

B. Physico-Chemical Analysis

All samples were analyzed for the following physico-chemical parameters; pH, temperature, turbidity, electrical conductivity (EC), total dissolved solid (TDS), total suspended solid (TSS), total solids (TS), total alkalinity (TA), chloride, total hardness (TH), Ca hardness, Hardness of Mg, Dissolved Oxygen (DO), Required biological oxygen (BOD), Chemical Oxygen required (COD), Nitrate, Nitrite, Fluoride, Phosphate, Sulphate, Ammonia and Iron. Physico-chemical analysis of water samples was carried out according to standard analytical methods [22].

III. RESULTS AND DISCUSSION

The data obtained from the current research are shown in the table n. 1 that was followed.

Temperature

The temperature of the slightly varied groundwater sample ranged from 25.11 to 27.31.

PH

The pH of groundwater samples was approximately neutral, ranging from 7.02 to 7.85.

Turbidity

Turbidity of groundwater samples obtained from 2.1 to 6.2 showing limits under CPCB.

EC

The EC is a measure of the total salt content in water [23]. It is a determination of the levels of inorganic components in water [24]. EC ranged from 571 µs / cm to 959 µs / cm.

TDS

Total dissolved solids are a measure of total inorganic substances dissolved in water [25]. TDS indicates the general nature of water quality or salinity. During the study, TDS is between 546 mg / l and 907 mg / l. The concentration of TDS was above the limit allowed due to the leaching of various contaminants into groundwater which can decrease potability and cause gastrointestinal irritation in humans and may also have a laxative effect particularly in transits [26]. Similar results have also been reported by Olaniya and Saxena [27].

TSS

In the sample, the minimum value was 31 mg / l and the maximum value of 75 mg / l of the sample was not. 4 and 1 could be due to the presence of different suspended particles. The total suspended solids are composed of carbonates, bicarbonates, chlorides, phosphates and nitrates of the organic matter of Ca, Mg, Na, K, Mn, salt and other particles. The effect of the presence of total suspended solids is the turbidity due to silt and organic matter. When the concentration of suspended solids is high, it can be aesthetically unsatisfactory for the bath [28].

Table 1: Physico-Chemical Parameters of the groundwater samples from MSW dumping sites at Jaunpur city

S.N.	Parameters	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10
1.	Temperature	25.42	25.21	27.13	26.39	25.11	25.89	26.89	26.81	27.31	26.18
2.	pH	7.81	7.02	7.85	7.61	7.23	7.11	7.43	7.59	7.68	7.77
3.	Turbidity(NTU)	6.0	4.2	5.9	3.2	2.1	5.7	4.1	6.2	5.7	5.2
4.	EC (µs/cm)	952	814	865	902	571	912	794	959	802	903
5.	TDS (mg/L)	896	790	837	879	546	874	756	907	751	869
6.	TSS (mg/L)	75	36	42	31	41	69	47	71	65	52
7.	TS (mg/L)	971	826	879	910	587	943	803	978	816	921
8.	TA (mg/L)	189	167	121	98	76	101	113	198	129	106

9.	Cl^- (mg/L)	140	285	213	109	121	148	169	252	278	201
10.	TH (mg/L)	295	307	280	298	150	200	197	247	261	219
11.	Ca (mg/L)	110	265	145	234	102	167	129	196	202	182
12.	Mg (mg/L)	58	42	35	64	48	33	68	51	59	37
13.	DO (mg/L)	4.12	3.9	4.01	3.91	5.13	4.97	6.29	6.23	4.57	4.08
14.	BOD(mg/L)	1.3	1.9	1.7	2.1	3.8	2.3	1.4	1.2	1.1	3.6
15.	COD(mg/L)	9.2	5.7	2.8	11.6	9.4	23.6	12.3	8.9	13.7	12.4
16.	NO_3^- (mg/l)	2.1	ND	ND	22.1	6.9	54	ND	7.8	0.1	4.7
17.	NO_2^- (mg/l)	0.51	ND	ND	0.02	0.08	0.46	ND	ND	ND	0.03
18.	F^- (mg/L)	1.1	0.2	0.1	0.5	ND	ND	0.7	ND	0.2	0.9
19.	$PO4^{3-}$ (mg/l)	0.01	ND	ND	0.01	0.05	ND	ND	0.07	ND	0.02
20.	SO^{4-} (mg/l)	11.2	6.0	2.9	8.1	12.7	122	46	171	49	78
21.	NH^{4+} (mg/L)	ND	1.2	0.1	2.7	0.8	4.3	1.6	1.8	0.5	1.7
22.	Fe^{++} (mg/L)	0.1	ND	ND	0.1	ND	0.3	0.2	0.1	ND	ND

***GW- Groundwater. ND: Not Detectable**

TS

The value of TS in this study was at least 587 mg / l and 978 mg / l maximum in sample n. 5 and 6 respectively.

Alkalinity

Total alkalinity was found in the range between 76 and 198 mg / l in groundwater samples mainly caused by OH, CO_3,

Chlorides

HCO3 Ions. The value of the chloride obtained from 121 to 285 mg / l as presented in the table is comparable with the standard values of 250 mg / l. The Department of National Health and Welfare Canada [29] reported that chloride in groundwater may be the result of both natural and anthropogenic sources, such as salt-containing runoff, the use of inorganic fertilizers, landfill leachate, effluent from septic tanks, animal feed, industrial effluents, irrigation drainage and seawater intrusion in coastal areas. Chloride is not harmful to humans at low concentrations, but could alter the taste of water at concentrations above 250 mg / l [30].

Total Hardness

The total hardness of groundwater samples was found in the range of 150 to 307 mg / l, which is compared to the standard value of 300 mg / l. Water hardness is usually due to multivalent metal ions, which come from minerals dissolved in water. However, Dzik reported an inverse relationship between water hardness and cardiovascular disease.

Calcium and Magnesium hardness

The calcium and magnesium hardness of groundwater samples was found to be highest in sample n. 2 and 7 and minimum in the sample n. 5 and 6, respectively, which are compared with the standard CPCB value.

Dissolved Oxygen

The DO of groundwater samples ranged between 4.22 and 5.74 mg / l. due to the ability of water to contain oxygen

Biological Oxygen Demand

The BOD ranges from 1.4 to 3.8 mg / l. which represent the amount of oxygen needed by the microbes to stabilize the biologically oxidable matter.

Chemical Oxygen Demand

The chemical oxygen demand ranged from 2.9 to 34.2 mg / l. The test is commonly used to indirectly measure the amount of organic compounds in the water. The majority of COD applications determine the amount of organic pollutants present in surface waters, making COD a useful measure of water quality.

Nitrate

The nitrate concentration was found in water samples up to 54 mg / l. Although only a sample does not do it. 6 exceed the allowed limit but show a moderately high concentration. Jawad et al also reported an increase in the concentration of nitrates in groundwater due to the wastewater discharged to the disposal site and probably indicate the impact of the leachate.

Nitrite

The nitrite concentration was found up to 0.51 mg / l. Nitrite reacts directly with hemoglobin in human blood to produce methemoglobin, which destroys the ability of blood cells to carry oxygen. It can also cause methemoglobinemia or "blue baby" disease. Humans should not consume water with nitrite levels above 1.0 mg / l, much less administer them to children.

Fluoride

The fluoride concentration in the water samples studied ranged from 0.01 to 1.1 mg / l. The concentration of low concentration fluorine in groundwater has been considered beneficial, but a high concentration may cause dental fluorosis (spots on the teeth) and a more severe skeletal fluorosis.

Phosphate

Phosphate concentration showed under the permissible limit varied up to 0.05 mg/l.

Sulfate

The sulfate concentration in the water sample ranged from 2.9 mg / l to 171 mg / l. Sulfate is a non-toxic anion but disorders such as catharsis, dehydration and gastrointestinal irritation have been linked to it when the concentration is high.

Ammonia

The concentration of ammonia (NH4 +) in the samples ranged from ND to 4.3 mg / L and probably indicates its origin from the leachate of RSU.

Iron

Iron concentration showed under the permissible limit varied up to 0.2 mg/l.

IV. CONCLUSION

On the basis of current research we can conclude that the aquifers near the MSW landfills represent the majority of the allowed limit of CPCB, but some of which reach the limit almost allowed, so far we can follow the safety we recommend the following. The study assessed the evolution of water quality in groundwater in Jabalpur near the MSW. A comparative study of groundwater, ie the well and the manual pumping water, was carried out by taking some important parameters such as pH, TSS, TDS, TS, TA, COD, nitrate, Cl, PO4-, F-, etc. In This investigation found that the maximum parameters were not at the level of contamination, with the exception of certain parameters such as nitrate, TDS, TSS, TS and TH in groundwater. Hence both types of groundwater meet the requirements for use in.

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