A STUDY ON IMPACT OF MUNICIPAL SOLID WASTE ON GROUNDWATER IN AND AROUND THE DUMPING YARD OF VISAKHAPATNAM, A.P, INDIA

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ABSTRACT: This study deals with physio-chemical characteristics of groundwater in the environs of dumping yard (GVMC), Visakhapatnam district, Andhra Pradesh. The dumping yard area is covering about 912 acres where study is carried out. Due to improper disposal of solid wastes, Hazard urbanization, industrialization leading to contamination of groundwater have been focused in this study. The improper and unscientific solid waste dumps in the unlined sewage drains drive pollutants into the groundwater regime which is an irrevocable loss and literally not possible to bring the quality of groundwater to its original state. The methodology of the project consists of field survey, collection of data. The primary data is compared with standard data (**IS: 10500, 2012**). 11 different groundwater samples were collected at kamalanagar colony, paradesipalem school premises, kothapalem village, kapuluppada MSW dumping yard ,thallavalsa (V), jayanthivani agraharam(V), Nedigattu(V), Chepalappada(V), Kannuru (V),Pedamusidivada(V), Tadi(V) which are around the dumping yard (Kapulauppada) during march 2016. The water samples are analyzed to identify the parameters of physical, chemical and trace metals on the basis of APHA standard methodology.

Keywords: Physico-Chemical Analysis, Trace Metal Analysi

INTRODUCTION:

Municipal solid waste products are the discarded/rejected material being left-out from the several public sources typically. Investigations declared that, in study area revealed that, rapid growth in population through the recent decades which led to increasing level of urban solid wastes. In most of the developing countries, municipal solid waste (MSW) disposal has become the major problem, majorly in the places where the density of population is very high and scarcity of land which is adequate for landfills(Sadek and El-Fadel, 2000).Municipal solid waste involves day-to-day discarded and consumed items such as food wastes, containers, presentation, and other miscellaneous like personal, commercial, institutional and professional sources. Environmentally friendly problems existing in the cities of developing countries, municipal solid waste management and its own effect on groundwater quality have been the most prominent in the modern times (Rajkumar et al., 2010). In India, ground water is the main source of drinking water and also indispensable source for living creatures. The problem in the quality of water has become acute nowadays (Kumar and Sinha, 2010). A lot of the industries have their own mechanism for handling professional solid waste. Currently, groundwater quality is the major concern and therefore emerged as one of the main environmental issues. Greater Visakhapatnam Municipal Corporation (GVMC) is the next biggest municipal organization in the status of Andhra Pradesh, India. Water demand for drinking and domestic purposes has been increasing due to improve of way of life of folks and demographic pressures (SwarnaLatha et al., 2009). Hence, this research has been taken to ascertain groundwater pollution hotspots in the environs of GVMC dumping area. Theeffluents of the Visakhapatnam steel plant, Hindustan Zinc Ltd,

coramandel Fertilizers, LG polymers move around in the course of groundwater movements and move towards marsh land through home areas due to topographic control.

STUDY AREA:

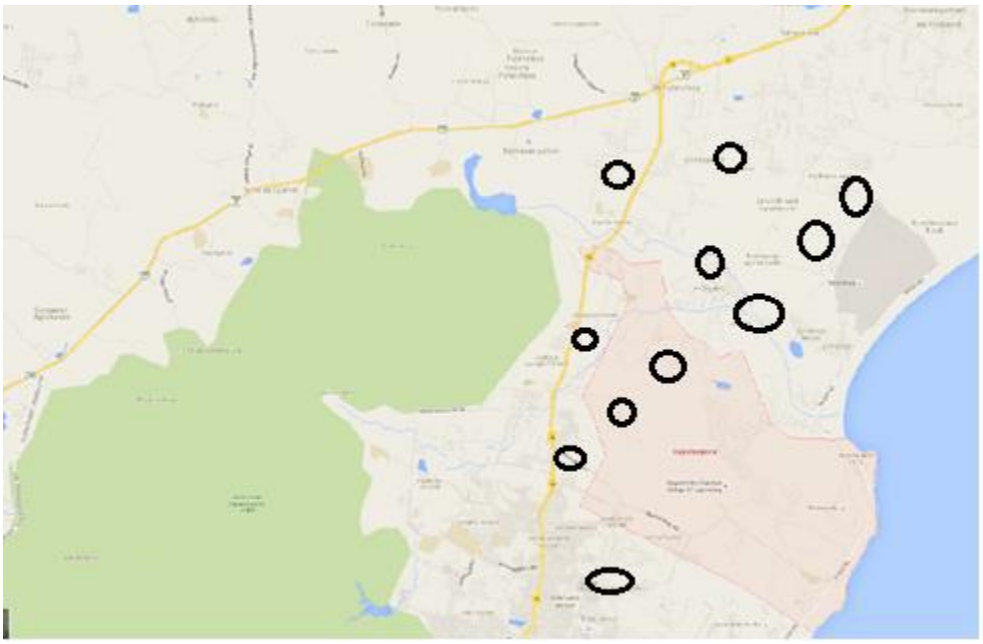


Figure: 1. Location Map of solid waste dumping yard in Visakhapatnam, AP.

The Latitude of kapuluppada is 17°68'. The Longitude of kapuluppada is 83°21'. Kapuluppada is located in sub-locality, Visakhapatnam locality, Vishakhapatnam District, Andhra Pradesh. The total quantity of solid waste generated per day is 1000 ton/day. The total area of the dumping yard is 912 acres of land in which all the solid waste apart from medical and hospital is dumped. The medical and hospital wastes are treated in incinerators at maridi, which is located beside the dumping yard.

METHODOLOGY:

In this study, about 11 water samples were collected at dumping yard and areas around dumping yard within 5km radius during March 2016 to analyze chemical parameters in laboratory following the guidelines of **IS: 10500, 2012**. The samples were analyzed for determining the concentrations of various chemical elements such as Na^{+}, K^{+}, po_4^{3-},NO^{3-}, SO_4^{-}, Cl^{-}, F^{-}, and Fe. Samples were analyzed using Flame Photometer for, Ca^{+}& Mg^{2+} elements, they were analyzedby EDTA Titrimetric method. NO^{3-}, PO_4^{3-}, Fe were analyzed using UV Visible Spectrophotometer method, All these procedures are part of APHA methodology for the examination of water and waste water. Trace metals of Al, Mn, Cu, Zn, Se, Rb, Cd, Pb and Co were analyzed using the Atomic Absorption Spectroscopy.

RESULTS AND DISCUSSIONS:

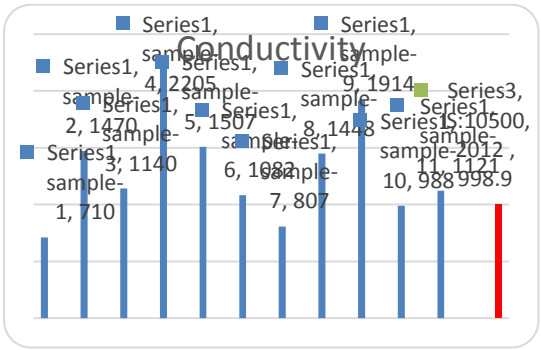
The chemical parameters obtained in this analyses revealing that the pH varies from 6.9 to 7.8 of alkaline nature within the permissible limits. The electrical conductivity (EC) values are in between 710 to 2205µs. The concentrations of Ca+, SO4-, F- and Cl- ions are observed closer to the maximum permissible limits in all the villages apart from kapulauppada (dumping yard). The concentrations of TDS and TH and Na+, Mg2+, and Fe have exceeded maximum permissible limits in kamalanagar colony, paradesipalem school premises, kothapalem village, kapuluppada MSW dumping yard. The higher contents in these villages could be seepage from the unlined sewage drain. These elements cause cardio vascular diseases which are reported in soft water areas. So far, no case has been reported regarding polluted groundwater in the area. The main source for sodium in groundwater resources is plagioclase feldspars, feldspathoids and clay minerals. Sodium content around 200 mg/l may be harmful to persons having cardiac and renal diseases and in women with toxemia associated with pregnancy (NAS, 1977). The concentration of sodium varies from 10 mg/l to 540 mg/l. Two samples found to be excess of Na+ than the maximum permissible limits in Kapulauppada and kannuru. The calcium is a major constituent of most igneous, metamorphic and sedimentary rocks.

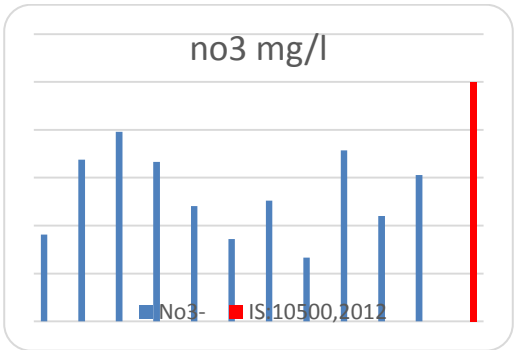
Chloride content of more than 250 mg/l makes the water salty; however, excessive chloride concentration affects the taste, but there is no known physiological hazard in the area. The chloride levels in natural water are an important consideration for the selection in public water supplies (Subramanian, 2000).Kapulauppada dump yard site and kannuru samples have higher chloride content. The fluorine is the most abundant element and is extensively distributed throughout nature (Kannan and Venkatesan, 1997). Fluoride plays a vital role in water quality management due to its adverse health effects. Fluoride also causes respiratory failure, hypotension and paralysis. Loss of weight, anorexia, anemia, wasting and cachexia are amongst the common findings in chronic fluoride poisoning (Jolly et al., 1973). The fluoride content in the study area ranges in between 0.38-0.72 mg/l. all the samples are in the permissible limits. The sulphate content in the area ranges from 24 to 246 mg/l. The higher contents of these elements in these villages could be leachates from the unlined sewage drains, dumping solid waste in an unscientific manner and also leachates from the solid waste dump yard at Kapulauppada site. Zinc is one of the essential elements required for proper functioning of the body system (Raja and Venkatesan, 2010). Zn ranges from 0.27-0.307. Other metals like lead, cadmium, and chromium, copper were found to be negligible in all the samples.

The results of physical, chemical parameters and trace metals of groundwater have been compared with the Bureau of Indian standards-10500 (2012) and World Health Organization (1971 and 1983). So far, no major studies have been carried out on solid waste interaction with groundwater. In this study, it is observed that the groundwater regime is being polluted due to improper dumping of solid waste in unlined sewage drains, besides geological causes.

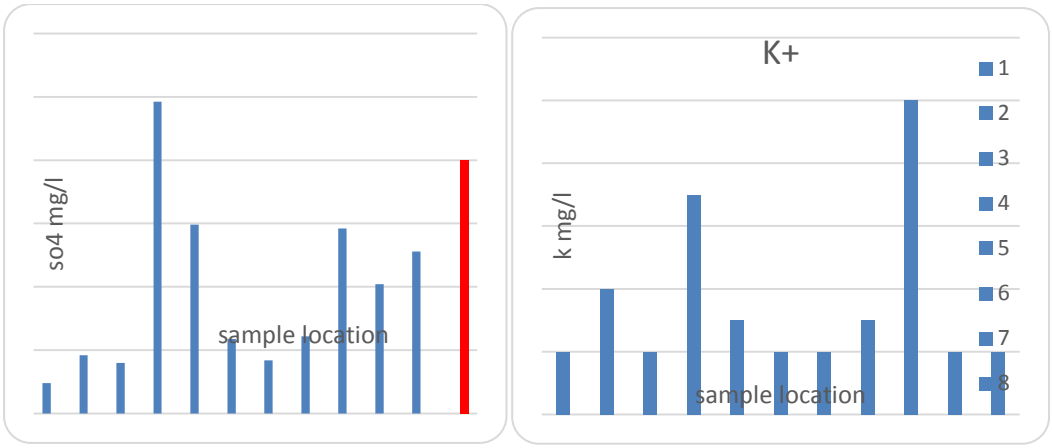
ANALYSIS REPORT

S.No	Parameters	2016 03-W 01	2016 03-W 02	2016 03-W 03	2016 03-W 04	2016 03-W 05	2016 03-W 06	2016 03-W 07	2016 03-W 08	2016 03-W 09	2016 03-W 10	2016 03-W 11	Drinking water specification as per IS:10500,2012
1.	pH	7.2	7.6	7.0	7.4	6.9	7.2	7.2	7.6	7.8	7.4	7.3	6.5-8.5
2.	Conductivity (µS/cm)	710	1470	1140	2205	1507	1082	807	1448	1914	988	1121	<1000 µS/cm
3.	Total Dissolved Solids at 105^{0}C	398	828	648	1262	943	664	458	869	1142	596	684	500 mg/l
4.	Chemical Oxygen Demand	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	Nil
5.	Chlorides a Cl^{-}	100	186	103	509	124	114	76	121	601	84	94	250 mg/l
6.	Total Hardness as CaCO3	268	344	340	1210	240	180	140	160	260	150	170	200 mg/l
7.	Phosphates as $PO4^{3-}$	0.42	0.51	0.66	0.74	0.58	0.36	0.31	0.48	0.68	0.49	0.82	--
8.	Sulphates as $SO4^{2-}$	24	46	40	246	149	59	42	61	148	102	128	200 mg/l
9.	Nitrates Nitrogen as NO3-N	3.63	6.76	7.92	6.66	4.82	3.44	5.04	2.66	7.14	4.40	6.11	10 mg/l
10.	Nitrites Nitrogen as NO2-N	0.66	0.38	0.22	0.31	0.52	0.49	0.32	0.44	0.58	0.55	0.82	--
11.	Ammonical Nitrogen as NH_3-N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
12.	Fluorides as F^{-}	0.54	0.44	0.58	0.46	0.69	0.58	0.51	0.38	0.72	0.69	0.59	1.0 mg/l
13.	Phenols	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.001
14.	Sodium as Na+	35	62	38	149	42	38	24	41	184	28	34	--
15.	Potassium K+	2	4	2	7	3	2	2	3	10	2	2	--
16.	Iron as Fe	0.974	0.450	0.053	0.062	0.124	0.104	0.098	0.214	0.182	0.091	0.102	0.3 mg/l
17.	Zinc as Zn	0.089	0.307	0.032	0.027	0.070	0.061	0.046	0.066	0.114	0.067	0.082	5 mg/l
18.	Lead as Pb	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05 mg/l
19.	Total Chromium as Cr	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05 mg/l
20.	Cadmium as Cd	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01 mg/l
21.	Copper as Cu	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05mg/l

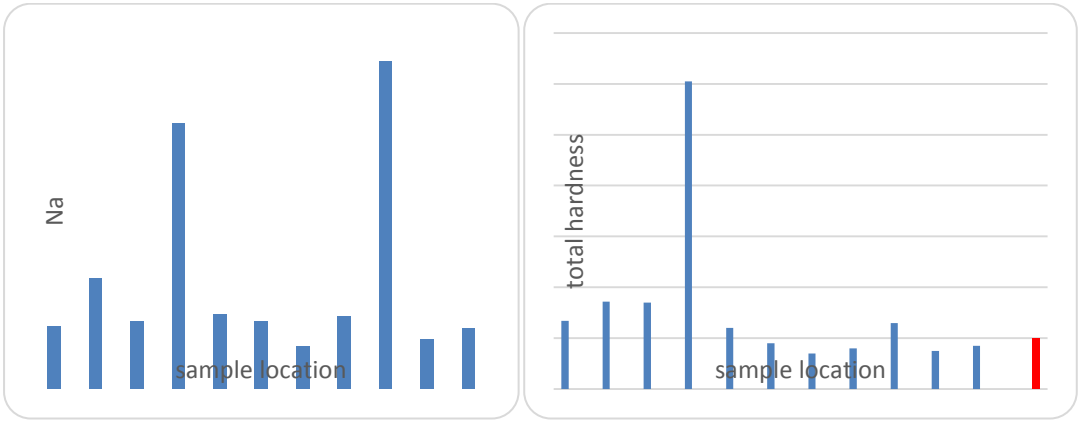




Comparison of Cl and $NO_3$with BIS standards for drinking water quality



Comparison of $SO_4$and K with BIS standards for drinking water quality



Comparison of Mg and Hardness with BIS standards for drinking water quality

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