

RESEARCH NOTE

Lead and Cadmium in the Groundwaters of Visakhapatnam Area, Andhra Pradesh, India

Abstract: High concentrations of lead and cadmium are reported for the first time in the groundwaters of Visakhapatnam area, attributable to increased human activities and lack of environmental protection. It suggests an urgent need for remedial measures to overcome future health hazards in this area.

Keywords: Lead, Cadmium, Groundwaters, Visakhapatnam, Andhra Pradesh.

Introduction: Elements such as lead and cadmium in groundwaters have recently received special attention as indicators of pollution as well as from the medical point of view (Trief, 1980). Consuming water with high lead and cadmium can cause serious health hazard.

Since 1975 in Visakhapatnam area the intensity of pollution of groundwaters has rapidly increased due to sweeping growth of industrial and urban activities, and lack of environmental protection (Subba Rao and Krishna Rao, 1990). Earlier study on the concentrations of trace elements in the groundwaters of this area, based on the data of 1981, reveals that the most significant toxic elements such as lead and cadmium are not detected (Subba Rao and Krishna Rao, 1988). However, a contrary view is currently prevalent due to a change of hydrogeochemical facies from Na-HCO₃ in 1975 through Na-Cl in 1981 to Na-Cl-SO₄ in 1992 in the study area (Table I). It is therefore the objective of the present report to draw attention on the concentration of lead and cadmium in groundwaters of the area.

Table I. Hydrogeochemical facies during 1975-1992

Year	Hydrogeochemical facies
1975 ^a	Na-HCO ₃
1981 ^a	Na-Cl
1992 ^b	Na-Cl-SO ₄

a: Subba Rao and Krishna Rao (1990).

b: Madhusudhana Reddy (1992).

Methodology: Thirty groundwaters samples were collected from dugwells in different parts of study area (Fig. 1). They were analysed for lead and cadmium using Atomic Absorption Spectrophotometer (the minimum detection limits of lead and cadmium are 0.5×10^{-4} and 0.3×10^{-5} mg/L respectively), following analytical methods prescribed by Brown *et al.* (1974).

Lead and Cadmium Concentrations: Table II shows the concentrations of lead and cadmium in the groundwaters. It is clear from this table that lead and cadmium are not detected in the groundwaters of the area except in some locations. Generally, they occur in very low concentrations and are also below the detectable levels in the groundwaters (Durfor and Backar, 1964) because of (a) their rare occurrence and (b) their nature of different geochemical behaviour (solubility and mobility).

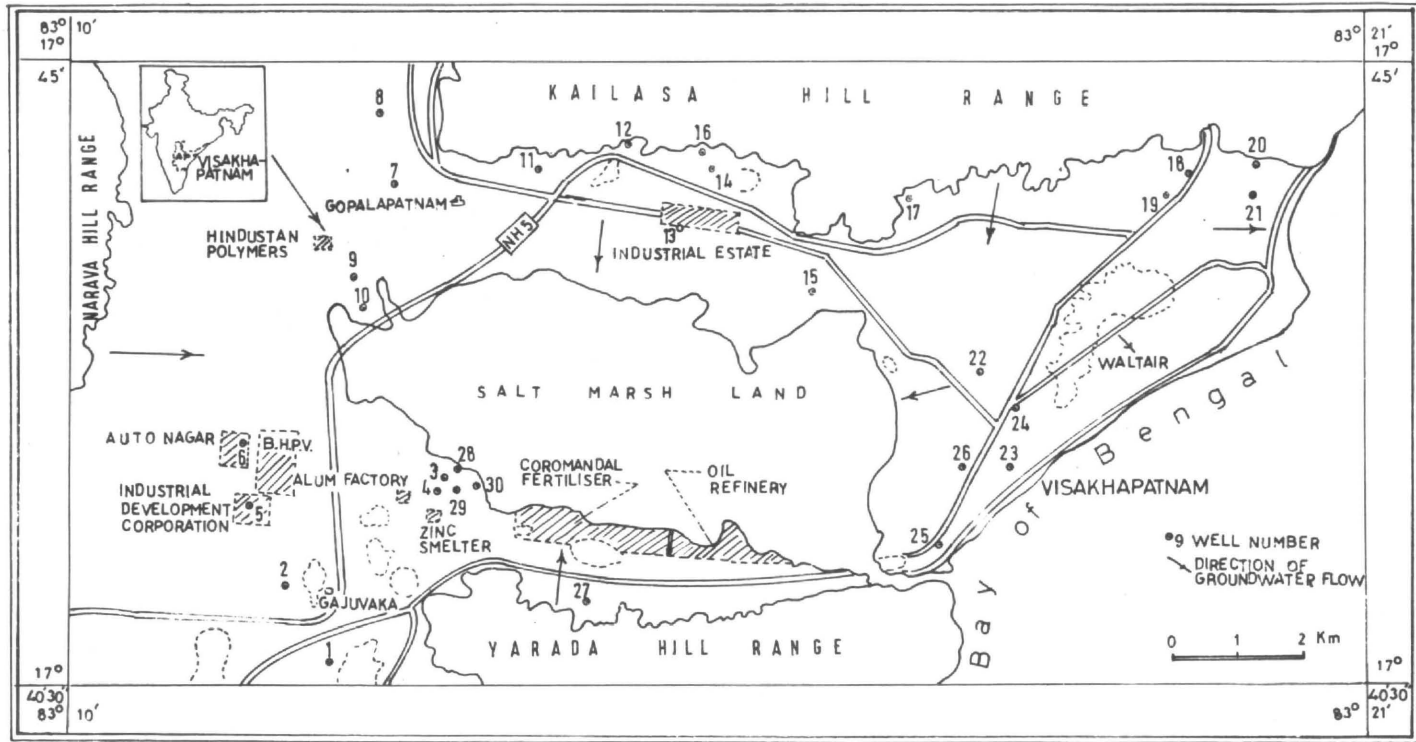


Fig.1. Study area

Table II. Lead and Cadmium in groundwaters of Visakhapatnam area

Well Nos. as shown in fig.1	Lead Concentration in mg/L	Cadmium	Affected by
1	N.D.	N.D.	_____
2	N.D.	N.D.	_____
3	0.050	0.070	Zinc Smelter
4	0.055	0.150	Zinc Smelter
5	0.082	N.D.	Industrial Development Corporation (Batteries, paints, plastics and fertilizers).
6	0.071	N.D.	Auto industries
7	N.D.	N.D.	_____
8	N.D.	N.D.	_____
9	0.050	N.D.	Polymers
10	0.050	N.D.	Polymers
11	N.D.	N.D.	_____
12	N.D.	N.D.	_____
13	0.050	N.D.	Industrial Estate
14	N.D.	N.D.	_____
15	N.D.	N.D.	_____
16	N.D.	N.D.	_____
17	N.D.	N.D.	_____
18	0.020	N.D.	Heavy traffic
19	0.019	N.D.	Heavy traffic
20	N.D.	N.D.	_____
21	N.D.	N.D.	_____
22	N.D.	N.D.	_____
23	N.D.	N.D.	_____
24	0.060	N.D.	Heavy traffic
25	0.053	N.D.	Heavy traffic
26	0.090	N.D.	Heavy traffic
27	N.D.	N.D.	_____
28	0.190	0.720	Zinc Smelter
29	0.180	0.490	Zinc Smelter
30	0.180	0.300	Zinc Smelter

N.D. - Not Detected.

Groundwaters near heavy traffic locations in the study area show low concentration of lead ranging from 0.019 to 0.090 mg/L (Table II). It may be attributable to the combustion of gasoline on highways (Moore and Ramamoorthy, 1984). At industrial locations, groundwaters show high concentrations of lead and cadmium range between 0.050 - 0.190 and 0.070 - 0.720 mg/L respectively. There are many industries such as Zinc Smelter, Oil Refinery, and those of fertilizers, paints, metal platings, plastics and storage batteries. Some of them discharge their wastes onto the ground without any proper treatment. Hence high concentrations of lead and cadmium could be the result of polluted waters. This is the first report on the occurrence of lead and cadmium from the groundwaters of the area.

The concentrations of lead and cadmium in the groundwaters influenced by the industries are higher than the maximum permissible limits recommended (0.1 and 0.01

mg/L. for lead and cadmium respectively) for drinking purpose (ISI, 1983), while the lead is within the safe limit in locations influenced by the highways (Table II). Prominent health hazards observed during this study in the area are nervous, heart, skin, gastrointestinal and respiratory disorders and miscarriage, the percentage of affected persons increasing towards the industrial locations. As per the information of the long-standing residents of these locations, these health hazards have started only after the establishment of these industries. Therefore, this study suggests the need for regular monitoring of the chemical quality of groundwaters and status of health to take necessary remedial measures for clean environment in this area.

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