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Uranium Concentration in Groundwater in Hisar City, India

VK Garg¹, A Yadav¹, K Singh¹,
M Singh¹, M Bishnoi¹, V Pulhani²

¹Centre for Radio-ecology, Guru Jambheshwar University of Science and Technology, Hisar-125001, Haryana, India

²Health Physics Division, Bhabha Atomic Research Centre, Mumbai, India



Groundwater quality of a region can influence the health of its inhabitants. A number of studies have so far been conducted on chemometric analysis of groundwater and shown that the major contaminants present in groundwater of Indian territories are salinity, fluoride, nitrates, arsenic and heavy metals.^{1,2} However, some recent studies have reported the presence of natural uranium and other radionuclides, of geogenic origin, in groundwater at several places in India.³⁻⁵

Uranium is omnipresent and the second heaviest naturally occurring element. It is present in the earth's crust with an average abundance of 1.8 mg/kg.⁶ Natural uranium mainly consists of ²³⁸U isotope (99.27%); ²³⁵U and ²³⁴U isotopes comprising 0.72% and 0.0055%, respectively.

Uranium is present in measurable concentrations in most of the natural water sources. It has been reported that the average concentration of uranium in the ocean water is about 3.0 µg/L. Drinking water contributes to almost 85% of the total ingested uranium by human beings.⁵ It has dual effect on human health due to its chemical and radioactive properties.⁴ Several authors believe that the chemical toxicity of uranium is more than its deleterious radiological effects.⁷ Chemical toxicity of uranium may cause damage to liver, kidneys and reproductive system; it may also induce bone cancer. Keeping this in view, the present study was undertaken

to quantify the uranium concentrations in the groundwater of Hisar city, Haryana, India.

Hisar is an approximately 50-km² wide district city situated in mid-western part of Haryana state, India (29° 09' 51" N, 75° 45' 55" E). Climate of the area is semi-arid with mean annual temperature of 28.3 °C, ranging from 2 °C in winter to 47 °C in summer. Surface moisture is very low in the region and water table varies from 4–30 m. The area has a population of 350 000, ≈30% of whom use groundwater for drinking purposes. The shallow hand-pumps are extensively used by the residents to extract the groundwater from upper layers of the aquifer.

To achieve the objective of this study, 38 groundwater samples were collected from the region in 1-L pre-cleaned polyethylene bottles. Uranium analysis was performed by laser fluorimetry method as described elsewhere.⁸

The uranium concentration in the studied area had a geometric mean of 33.9 (range: 5.3–113.5) µg/L (Fig 1). The concentration in 77% of samples was lesser than 60 µg/L—the AERB, Indian Standard. But, considering the WHO standards, only 16% of the samples had uranium concentration within the permissible limit—equal to or lower than 15 µg/L. Considering the results, it is necessary to further study the uranium in groundwater of the region so that health policymakers can develop ap-

Correspondence to
V Kumar Garg, PhD,
Centre for Radio-ecology,
Guru Jambheshwar
University of Science
and Technology,
Hisar-125001, Haryana,
India.
E-mail: vinodkgarg@
yahoo.com
Received: Oct 31, 2013
Accepted: Mar 24, 2014

Cite this article as: Garg VK, Yadav A, Singh K, *et al.* Uranium concentration in groundwater in Hisar city, India. *Int J Occup Environ Med* 2014;5:112-114.

V. K. Garg, A Yadav, K Singh

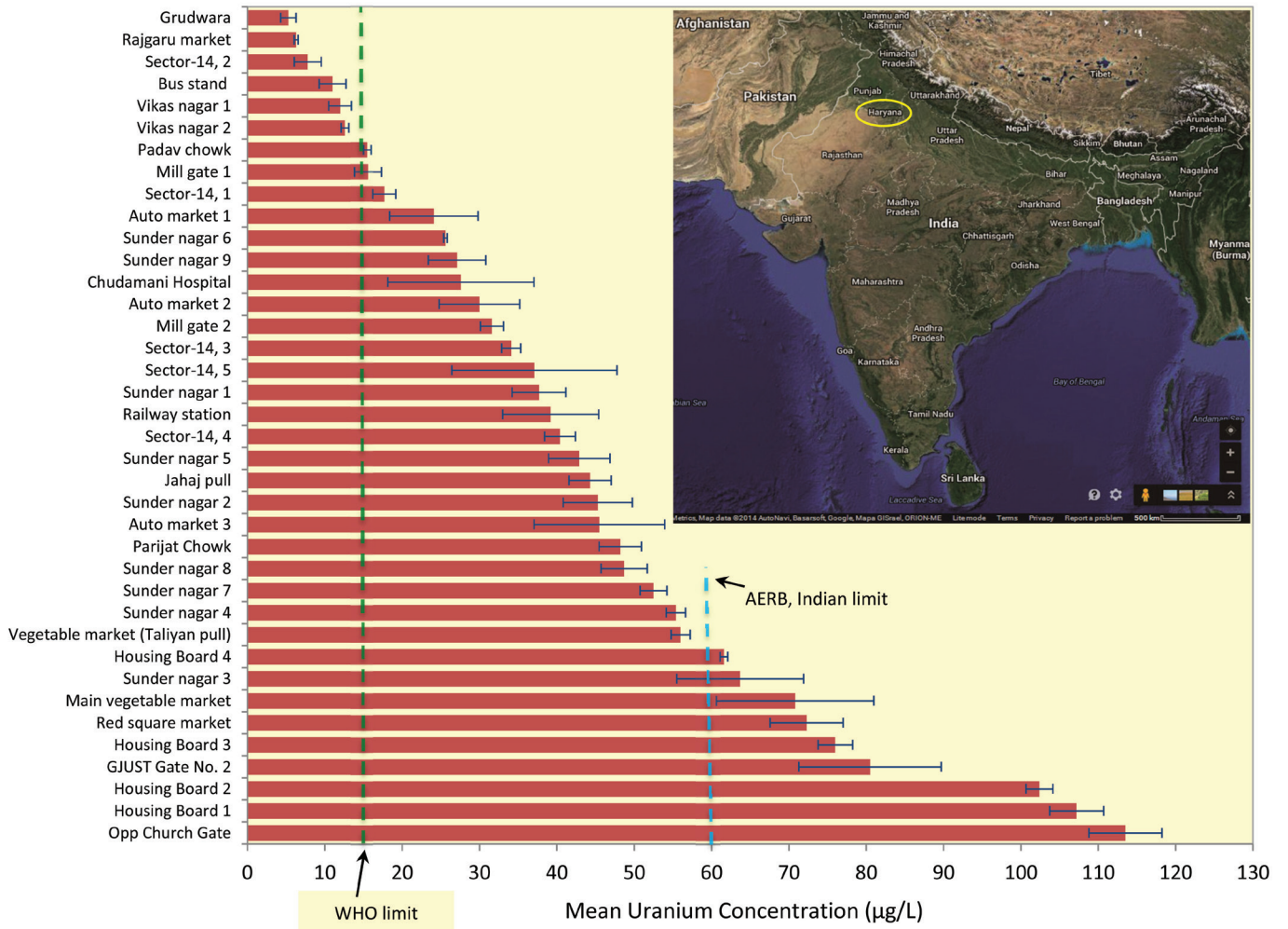


Figure 1: Distribution of uranium concentration in groundwater in Hisar city, Haryana, India. Values are mean concentration of three readings. Error bars represent 95% CI of the mean.

appropriate strategies to take proper actions.

Acknowledgements

Authors are thankful to Board of Research in Nuclear Science, Department of Atomic Energy, (DAE-BRNS), Mumbai, India, for providing the financial assistance for the conduction this research work.

Conflicts of Interest: None declared.

References

1. Kumar Garg V, Singh B. Fluoride signatures in groundwater and dental fluorosis in permanent teeth of school children in rural areas of Haryana State, India. *Int J Occup Environ Med* 2013;4:107-8.
2. Arif M, Husain I, Hussain J, Kumar S. Assessment of fluoride level in groundwater and prevalence of dental fluorosis in Didwana block of Nagaur district, Central Rajasthan, India. *Int J Occup Environ Med* 2013;4:178-84.
3. Singh S, Rani A, Mahajan RK, Walia TPS. Analysis of uranium and its correlation with some physico-chemical properties of drinking water samples from Amritsar, Punjab. *Journal of Environmental*

- Monitoring* 2003;**5**:917-21.
4. Sridhar-Babu MN, Somashekar RK, Kumar SA, *et al.* Concentration of uranium levels in groundwater. *Int J Env Sci Tech* 2008;**5**:263-6.
 5. Singh M, Garg VK, Gautam YP, Kumar A. Spatial mapping of uranium in groundwater and risk assessment around an atomic power station in India. *Environ Engg and Manag J* 2013, Available from <http://omicron.ch.tuiasi.ro/EEMJ> (Accessed October 24, 2013).
 6. Mason B, Moore CB. *Principles of Geochemistry*, New York, Wiley, **1982**.
 7. Tahir SNA, Alaamer AS. Concentrations of natural radionuclides in municipal supply drinking water and evaluation of radiological hazards. *Environmental Forensics*, 2009;**10**:1-6.
 8. Campen W, Bächmann K. Laser-induced fluorescence for the direct determination of small concentrations of uranium in water. *Microchimica Acta* 1979;**72**:159-70.

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