FLUORIDE AND NITRATE LEVEL IN GROUNDWATERS OF SOME VILLAGES OF DUDU TEHSEEL, JAIPUR DISTRICT

Alka Kataria*

Abstract

Ground water quality was studied in some villages of Dudu tehseel of Jaipur district by systematic collection and analysis of samples. The samples were collected during the month of February, 2009 and were analyzed for pH, total dissolved solids, chloride, nitrate and fluoride. The analysis showed that three villages had high fluoride and nitrate level than the maximum permissible limits when compared with the prescribed Indian Standard Limits for drinking water. TDS, Chloride values were high in Gadoti region whereas found lowest in Kapadiawas region.

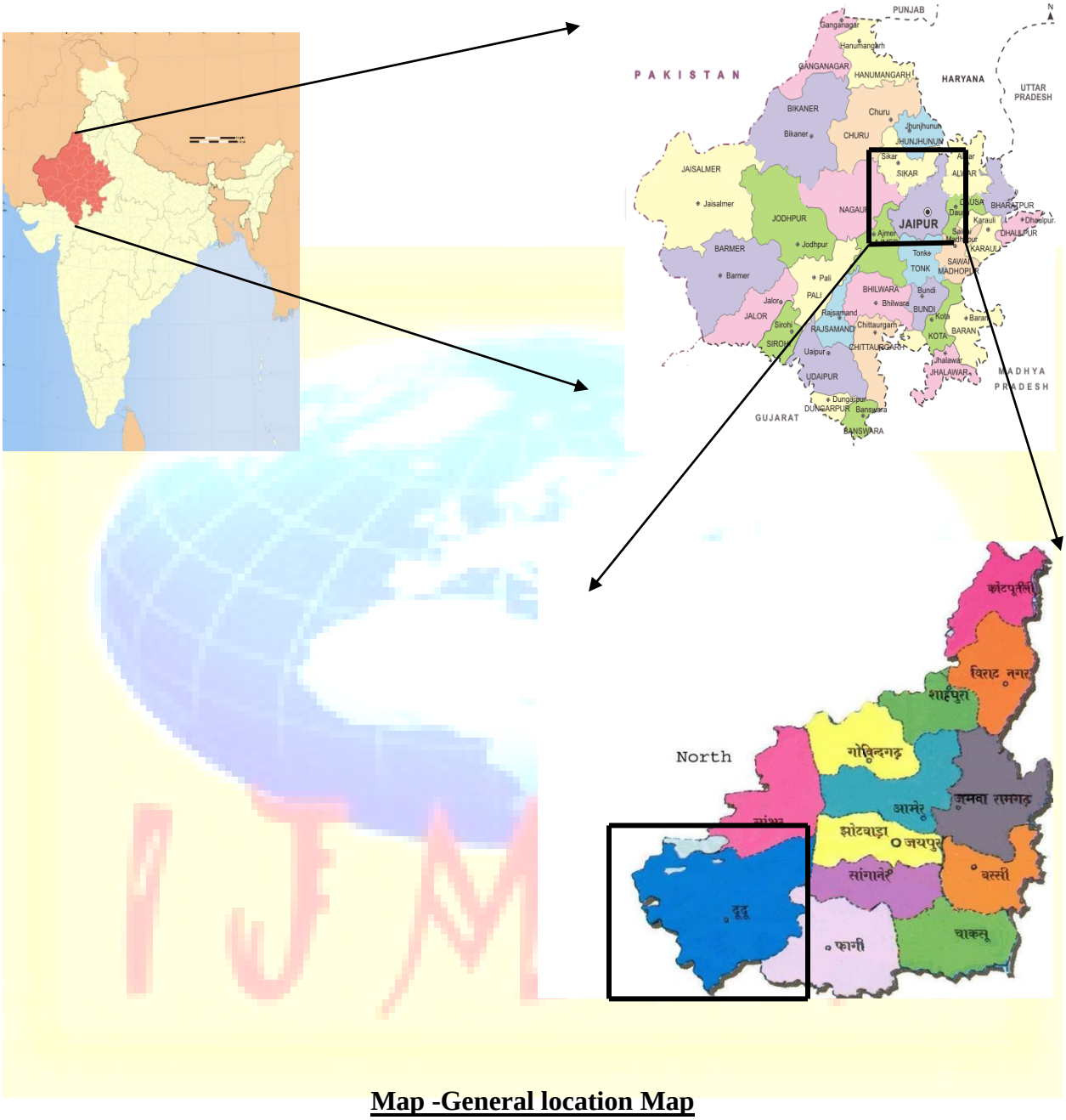
* Department of Environmental Engineering and Disaster Management, Poornima Institute of Engineering and Technology, Jaipur.

Introduction

Deleterious effects of nitrates, especially on infants and fluorides on human beings are very well known. Fluoride has beneficial and detrimental effects on human beings. The beneficial effect of fluoride is its capability to help in preventing dental cavities when present in optimum amount i.e. 0.6-1.2 ppm in drinking water. But, on the detrimental side, long term consumption of drinking water (mainly ground water since this contains more fluoride than surface water), food habits (tooth paste, tobacco, mouthwash, brick, tea, fish, medicine, various vegetables, ragi, bajra etc) and inhalation of air containing high fluoride content (fluoride level in atmosphere rises during the industrial and Volcanic activity) can lead to Fluorosis viz: Dental Fluorosis, Skeletal Fluorosis, or non-skeletal manifestations, this is because fluoride has chemical affinity with calcium therefore it reacts with calcium containing body parts e.g. teeth and bones. Nitrate poisoning causes methamoglobinemia, which occurs due to the attachment of nitrite (nitrate is converted into nitrite in our body cells) with haemoglobin and forming methamoglobin instead of oxy-haemoglobin i.e. methamoglobin formation reduces the oxygen carrying capacity of Hemoglobin (Maiti, 2001).

Dudu tehseel lies in south west region of Jaipur district and covers an area of 1,870.64 sq. km. The five villages in Dudu tehseel are located near a region known as Gadota of Dudu tehseel, present on National Highway-8, which lies 48 Km from Jaipur and 17 Km from Dudu. The selected villages were Gadoti, Sheoshingpura Basadi, Nasnoda, Kapadiawas, Chandpura.

The main source of drinking water for the major population of this area is water obtained from hand pumps. So a study was conducted to access the quality of drinking water with respect to nitrate, fluorides, pH, TDS, and chloride contents of the ground water samples.



Map -General location Map

Materials and methods

Samples were collected from hand pumps, one sample from each village, once in the month of February, 2009 in polyethylene bottles. Prior to the collection, bottles were rinsed thoroughly with sample water. Immediately after collection, the samples were labeled and the relevant details such as name of village, date and time of collection etc were recorded.

All the given parameters were analyzed following the Standard Methods (APHA 1996) and using precise instruments.

Results and Discussion

The pH values of analyzed ground water samples ranged from 7.30 (Chandpura) to 8.20 (Sheoshingpura Basadi), which is within the permissible limit i.e., 6.9 to 9.2 as per WHO (1984). The carbonate ion is dominant when the pH remains above 8.3. However, carbonate in all the samples is absent.

Total dissolved solids (TDS) 872 mg/lit (Kapadiawas) to 7778 mg/lit (Gadoti). TDS value of only Kapadiawas region as within the permissible limit i.e., 500-1500 mg/lit acc to WHO (1996) and others have TDS value above the permissible limit.

Table1: Details of the analysis of the studied samples

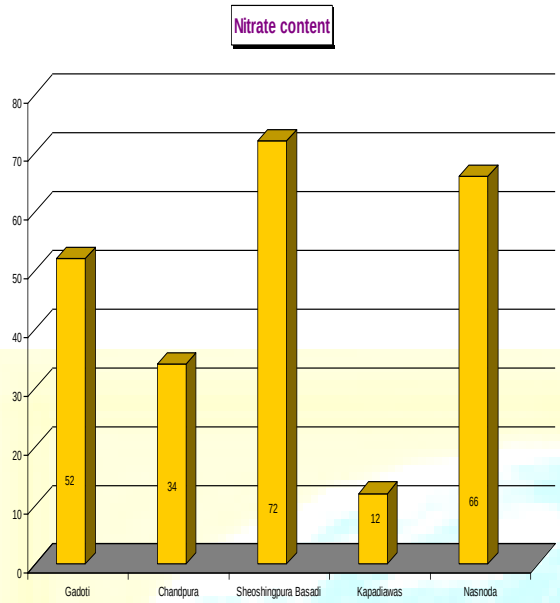
S.no.		1.	2.	3.	4.	5.
Location		**Gadoti**	**Chandpura**	**Sheoshingpura Basadi**	**Kapadia--was**	**Nasnoda**
TDS		7778	5265	2654	872	5256
pH		7.80	7.30	8.20	7.80	7.70

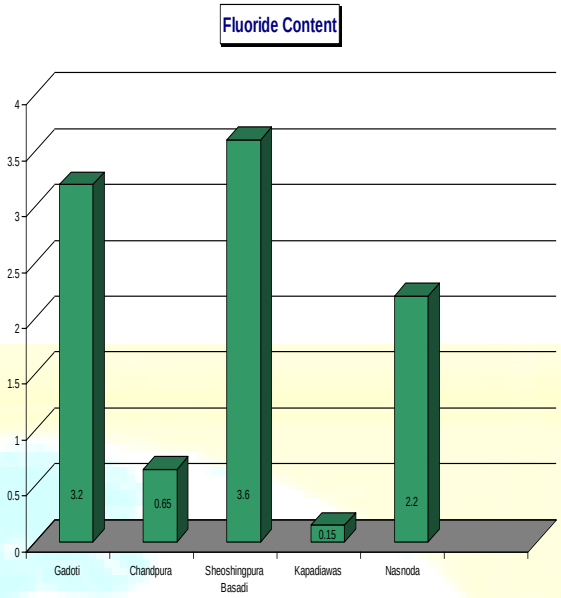
Cl^-	Results in mg/lit	3758	2772	1503	312	2567
NO_3^-		52	34	72	12	66
F^-		3.20	0.65	3.60	0.15	2.20

Chloride concentration varied from 312 mg/lit (Kapadiawas) to 3758 (Gadoti). The chloride content of all the water samples was higher than permissible limit i.e. 200-600 mg/lit by WHO (1996). High chloride content in drinking water gives a salty taste and people who are not accustomed to high chlorides can be subjected to laxative effects (Garg et.al. 1998).

Nitrate content of Gadoti, Sheoshingpura basadi, Nasnoda was higher mainly due to the agricultural fields where the nitrogenous fertilizers make their entry into ground waters due to leaching. The poor sanitation level is also another important source contributing high amount of nitrate in ground water (Chaudhary et.al. 2007)

Fluoride content of ground water samples ranged from 0.15 mg/lit (Kapadiawas) to 3.60 mg/lit (Sheoshingpura basadi). The maximum permissible limit is 1.5 mg/lit (WHO 1984). Gadoti, Sheoshingpura basadi, Nasnoda showed higher concentration of fluoride than maximum permissible limit. Fluoride causes health hazards at both, lower and higher concentrations. Lower concentration of fluoride (<0.5) causes dental carries, while higher concentration (above 1.5 mg/lit) causes dental and skeletal fluorosis (Suthar et.al. 2005). But, despite of low Fluoride concentration in drinking water both dental and skeletal fluorosis was observed in Chandpura. The possible reason may be more intake of fluoride through food materials like tea, tooth paste amounting high concentration of fluoride. Therefore, there is no cent percent conformity that the prevalence of fluorosis among inhabitants is carried by mainly drinking water itself.





Conclusion and Suggestion:

The above observations in the present study indicate the higher or lower values of all the parameters than the permissible limit in the samples. They minimize the suitability of these samples for drinking purposes without any treatment.

The sample from Gadoti was having highest values of all the parameters. It is suggested that this water sample should not be used for drinking and domestic purposes as it can create health related problems.

The degradation of the quality of ground water can be controlled by improving sanitary and drainage systems, minimizing the applications of nitrogenous fertilizers and water management practices on scientific lines. Further in few areas of higher fluoride content Nalgonda Technique (Chaudhary, 2009) of defluoridation of water may be adopted, if change of source of water is not feasible.

References

- APHA (1996): Standard methods for the examination of water and wastewater. American public health association, Washington D.C.
- Chaudhary, A (2009): Flouride distribution and fluorosis in some villages of Dudu tehsil of Jaipur district, M.Phil Thesis, International College for Girls, Jaipur.
- Chaudhary, P, Dagaonkar, A, Praveen, S (2007): Physico-chemical analysis of ground waters for Evaluation of Drinking water quality at Dhar Town, Madhya Pradesh, Nature Environment and Pollution Technology **6**(1): 109-112.
- Garg,V.K, Deepshikha, Dahiya, S, Chaudhary, A (1998): Groundwater quality in rural areas of Jind District, Haryana, Journal of Environment and Pollution **5**(4): 285-290.
- Maiti, S.K. (2001): Handbook of methods in Environmental Studies-Water and waste water analysis, Vol. 1, ABD Publishers, Jaipur.
- Suthar, S.S, Singh, C, Kumar, R, Diviya, G.S, Kaushik, M.K (2005): Ground water Quality of Sriganganagar city, Rajasthan, Nature Environment and Pollution Technology **4**(4): 515-519.
- WHO. 1984. Guideline for drinking water quality (vol 2).