ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Analysis of Nitrate and Physicochemical properties of Ground and Underground Water in Northern Bijapur district, Karnataka India

MS Yadawe*, AS Pujar, US Pujeri and SC Hiremath

SB Arts and KCP Science College Bijapur, Karnataka India

ABSTRACT

Nitrogenous material such as organic matter and ammonia may be oxidized to nitrate by organisms. Nitrate may also be released into the environment by disposal of domestic sewage and use of nitrate based fertilizers. Presence of elevated concentration of nitrates in drinking water poses to have potential health hazards related with methaemoglobinamia. High nitrate is alarming as it indicates possibility of seepage from sewage. Many samples had nitrate within the maximum permissible limits recommended by ICMR, yet most of the water is not potable due to high nitrate. The most efficient way to prevent nitrate impacts is to identify the sources of nitrate and to reduce them at the source. This study shows the important role of the sub soil, combined land use in determining the source of nitrate in ground water. An attempt was made to investigate the ground water quality of northern part of Bijapur district with respect to nitrate and other physico-chemical properties. It was found that a few water samples had elevated nitrate concentration while the rest water samples had nitrate concentrations falling within the standard limits.

Key words: Nitrate, ground water, methaemoglobinamia and elevated.

***Corresponding author**
E-mail: Mallikarrjun_yadawe@yahoo.com.

INTRODUCTION

Water the "Elixir of life" is facing a severe threat due to pollution. The presence of elevated concentrations of nitrate in drinking water supplies continuous to have potential public health implications related to the occurrence of methaemoglobinamia in infants [1]. Although India has substantial fresh water resources, there is an acute shortage of safe drinking water of acceptable quality, especially in rural area's [2]. Nitrate is highly water soluble and therefore trends to migrate from soil into ground water. Ingested nitrate is reduced to nitrite which subsequently hinders the ability of blood to transport oxygen to body tissues, this condition has been reported to be fatal in numerous cases [3]. The effect of chronic exposure to nitrate via drinking water is the debate. Numerous studies have suggested a link between the consumption of water containing elevated concentration of nitrate with various forms of cancers [4, 5]. Other health effect on humans that are potentially influenced by elevated levels of nitrate in drinking water include tetragonic toxicity and hypertrophy of the thyroid [6]. Nitrate in high concentration has been observed in ground water of churu of Rajasthan [7]. Presence of nitrates in ground water and its relation with other physico-chemical constituents of water has been studied [8]. High nitrate may cause methaemoglobinamia gastric cancer and birth defects [9]. In an effort to prevent the diseases ICMR has recommended the concentration of 20mg/l nitrate in water to be used for infant feeding, while more than 100mg/l was not recommended for human consumption. Moreover, the increased nitrate level in drinking water may adversely affect the central nervous system [10]. The research work is being persuaded to analyse ground water quality and to find out chemical and bio-chemical remediation of problematic ions. In this context the work published here provides insight into the problems faced by the people of northern Bijapur district, Karnataka India.

MATERIALS AND METHODS

Sample collection and analysis of water samples- Sampling locations were selected at random. Utmost care was taken during sampling to avoid any kind of contamination. Water samples from different sources were collected in clean polythene bottles. Suspended matters in the samples are removed by filtering through wattman No.542 filter paper prior to analysis. Temperature and pH were measured during sampling procedure itself. Nitrate in water was estimated by phenol-di-sulphonic acid method [11]. Standard methods were used for determining pH, dissolved solids, hardness etc [12].

RESULTS AND DISCUSSIONS

In the studied localities, samples were free from colour and odour. The pH values of ground water varied from 7.1 to 8.32 indicating slightly alkaline nature. The slight alkaline nature of ground water may be due to the presence of fine aquifer sediments mixed with clay and mud. In general the pH was within the limits of standard values (APHA 1985). The value of Total alkalinity of water samples ranges from 60 to 380mg/l. The alkalinity was higher than permissible limits i.e (200mg/l) is more than 50% samples. The total dissolved solids (TDS) in

ISSN: 0975-8585

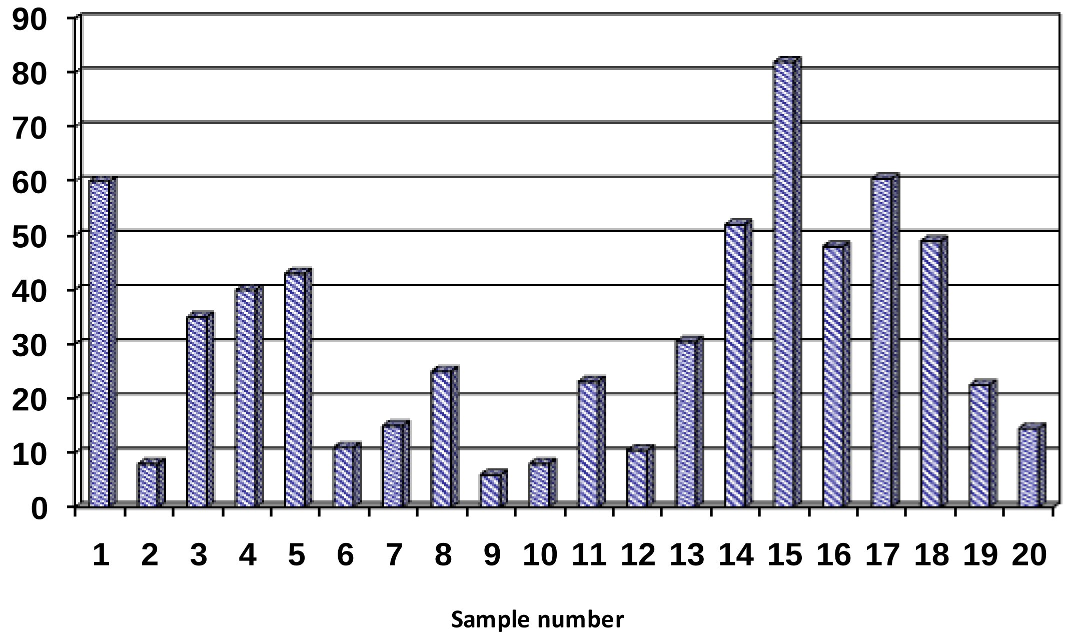
drinking water revealing the saline behavior of water. According to classification, only one sample was slightly saline category. The TDS values ranged from 182 to 1550 mg/l. Minimum (182mg/l) and maximum (1550) concentration of TDS was observed in No.2 and NO.15 samples respectively. According to WHO (2000), TDS should be 600 mg/l. Total hardness ranged from 144 to 1160 mg/l. Minimum (144mg/l) was observed in sample No.7, where as maximum hardness (1160 mg/l) was reported in sample NO.16. WHO recommended safe permissible limit for hardness i.e 500 mg/l. Water hardness in most ground water is naturally occurring from weathering of limestone, sedimentary rock and calcium bearing minerals. Hardness can also occur locally in ground water from excessive application of lime to the soil in agricultural areas. Very hard water results in urinary concretions, disease of kidney or bladder or stomach disorder.

Minimum (6.0mg/l) and maximum (82 mg/l) nitrate content was observed from sample No.9 and NO. 17 respectively. Due to its solubility and anionic form, nitrate is very mobile and can easily leach into the water table [14]. The most common sources of nitrate in ground water are atmospheric fallout, sanitation facilities, irrigational activities and domestic effluents [15]. WHO recommended safe permissible limit for nitrate i.e. 50 mg/l (Table.1).

Table 1. Nitrate concentrations and other physico-chemical parameters of ground and underground water Northern Bijapur district.

S.NO	Village	pH	Alkalinity Mg/l	TDS Mg/l	Total hardness Mg/l	Nitrate Mg/l
1	Utagi	7.97	60	542	225	60
2	Singagi	8.32	284	182	400	8.0
3	Horti N	7.82	204	683	257	35
4	Horti S	7.60	88	695	193	40
5	Horti E	7.65	202	765	257	43
6	Bijapur	7.10	144	365	1030	11
7	Makanapur	7.80	40	308	144	15
8	Aigali	7.85	372	258	824	25
9	Baratagi	7.78	204	246	825	6.0
10	Ittangihal	7.90	180	260	154	8.0
11	Toravi	8.30	212	466	180	23.1
12	Nagathan	7.60	260	268	840	10.50
13	Minchanal	7.80	268	525	700	30.5
14	Indi	7.20	360	460	620	52
15	Domanal	7.18	300	1550	880	82
16	Siddapur	7.80	380	945	1160	48
17	Rugi	8.16	256	1006	920	60.5
18	Zalaki	8.20	245	1160	935	49
19	Chadachan	7.80	214	1180	780	22.5
20	Hanchinal	7.90	120	1200	625	14.5

Nitrate content in water samples of Northern Bijapur



Almost 20% water samples had NO_3^- concentration higher than permissible limit. Higher concentration of $NO3^-$ in water causes disease called "methaemoglobinamia" or known as " Blue-Baby Syndrome". It is particularly infant disease up to 6 months child.

CONCLUSION

Significant concentrations of nitrate were found (20%) in ground water of study area and in a significant number of cases ,these exceeded the WHO Guideline value for drinking water of 50 mg/l. Proper location of drinking water are key practices to avoiding nitrate contamination of drinking water. Management practices to reduce the risk of contamination from applied fertilizers and manure help keep the water supply safe.

If drinking water exceeds the acceptable nitrate-nitrogen standard, the choices are to use an alternate water supply or treat water. An alternate supply may be bottled water for drinking , especially for infant formula or a new water source in a different location or aquifer. Water treatment options are distillation, reverse osmosis or ion exchange methods.

We suggest that the remediation activities should be focused on the main factors such as nutrients from agricultural activities. However, the industrial activities should be closely monitored to reduce their possible effects on the level of nitrate pollution.

ACKNOWLEDGEMENTS

The authors are grateful to Management B.L.D.E.Association, UGC New Delhi, Principal, HOD of Chemistry of S.B.Arts and K.C.P.Science college Bijapur. We appreciate R.H.Bidari for editing our manuscript.

ISSN: 0975-8585

REFERENCES

1. Johnson CJ, Kross BC. American J Int Medicines 1990; 18 (4): 449-457.
2. Kumar Rakesh, Singh RD, Sharma KD. Curr Sci 2005; 89 (5).
3. Johnson CJ, Barrud PA. American J Medicines 1987; 257 (20): 2796-2797.
4. Cuello C, Correa P, Haenszel W, Gordillo G, Brown C. J Natl Cancer Inst 1976; 57 (5): 1015-1020.
5. Gilli G, Corrao G, Favillis. Total Environment; 1984; 34 (1-2): 35-48.
6. Dorsch M, Scragg RK, McMichael RK. American J Epidemiology 1984; 199; 473-486.
7. Ozha DD, Varshney Bohra J. Ind J Environmental Health 1993; 35(1): 15-19.
8. Vijaykumar, Sai V Rao. Ind J Environmental Health, 1993; 35(1): 40-60.
9. Mirvish SS. Nature 1985; 315: 461-462.
10. Chern L, Kraft G Postle J. Nitrate in ground water a continuing issue for Wiscnsin citizens. Wisconsin Department of natural resources. http://www.dnr.state.us/org/water /dwg/gw/pubs/Nitrate.pdf Last visit;30-07-05.
11. Michael J Taras. In; Standard methods of chemical Analysis, Vol. II, part B edited by Welcher, FJd Van Nostrand company,Inc, Princeton, New Jersey.USA ;1963.
12. Standard methods for Examination of water and waste water 16th edition APHA, AWWA, WPCF, Washigton D.C 1985.
13. Rabinove CJ, Long Ford RH, Brook Hert JW. Saline water resource of North Dakota U.S Geological survey of water supply paper 1958;1428:72.
14. Fetter C W. Applied Hydrology, 2nd edition Merril Publishing Company, London 1988, 592.
15. Ritzi r W, Wringht S L, Mann B, Chen M. Analysis of temporal variability in hydrochemical data used for multivariate analysis, Ground water 1993; 31: 221-229.