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Investigation of Nitrate, Nitrite and physicochemical properties of Southern Bijapur district, Karnataka India

M.S.Yadawe*,A.S.Pujar,U.S.Pujeri and S.C.Hiremath
S.B.Arts and K.C.P.Science College Bijapur-586103.

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ABSTRACT

Nitrate and nitrite are naturally occurring ions that are ubiquitous in the environment. Both are products of the oxidation of nitrogen (which comprises roughly 78% of the atmosphere) by micro-organisms in plants, soil or water and to a lesser extent by electrical discharges such as lightening. After a period of time, the nitrates seep into the water table. This is a concern primarily for those whose household water source is a well rather than their city. Nitrates can cause cancer in humans, when consumed over a period of time. The objective of this study is investigation and determination of nitrate, nitrite and other physico-chemical parameters of Southern Bijapur district. 30 samples of water were analysed for pH, TGS, Total hardness, alkalinity, nitrate and nitrites. The southern part of Bijapur district had more than the maximum acceptable concentration (MAC) for nitrate in drinking water. It was concluded that nitrate contents in drinking water was found to be 8.0 to 392 mg/L.

Introduction

As the whole human population needs drinking water for sustaining life, the provision of a safe water supply is a priority issue for safeguarding the health and wellbeing of humans. The production of adequate and safe drinking water is the most important factor contributing to a decrease in mortality and morbidity in developing countries. The World Health Organization (WHO) reported that nearly half of the population in these countries suffers from health problems associated with lack of drinking water or the presence of microbiologically contaminated water[1]. In the developing countries more than 60% of population has access to pure drinking water[2].

Water is a very good solvent , hence it dissolves some toxic and hazardous substances, producing water pollution problem posing many public parameters of interest for water quality assessment and nitrates out of them. An increase of nitrates in water is often associated with farming fertilizer ,pesticide or poor sanitary activities[3-7].The WHO guideline for nitrates in drinking water is established to prevent methemoglobinemia (blue babies), which is lethal in babies and can be potentially hazardous with health risks for considerable groups of people and depends on the conversion of nitrates to nitrites and wells which were shallow, dug of located on large farms or springs were more likely to have elevated concentrations of nitrates[8-11].The use of nitrate contaminated drinking water to prepare infant formula is a well known risk factor for infant methemoglobinemia. Affected infants develop a peculiar blue-grey skin color and may become irritable or lethargic depending on the severity of their condition. The condition can progress rapidly to cause coma and death if it is not recognized and treated appropriately[12]. Contamination of drinking water by nitrates is an evolving public health concern since nitrates can undergo endenous reduction to nitrites (nitrate (III)), and nitrosation of nitrites can form N-nitrose compounds, which are potent carcinogens. This reduction process runs relatively fast in the alimentary canal of infants under the age of 6 months, so can lead among infants to the disease called methemoglobinemia (blue-baby syndrome)[13]. There is a positive association between nitrates in drinking water and non-Hodgkin lymphoma and colorectal cancer[14]. In 1986 WHO fixed the limit of the contents of nitrates and nitrites in drinking water, taking guidance from which Indian standards were developed. There is a positive association between nitrates in drinking water and non-Hodgkin lymphoma and colorectalcancer[14].

The purpose of this study is to monitor nitrate and other physico-chemical properties of ground water in Southern Bijapur district. The data will be used to characterize the groundwater. This will help water resource planning in the area and will provide a base line for future studies of water quality and trends. Therefore in the present study an attempt is made to evaluate the suitability of the ground water of Southern Bijapur district, Karnataka India for the purpose of drinking and irrigation with reference to recommended limits set by WHO.

Material and Methods

Study area:

Bijapur district is located in the northern part of Karnataka state. It falls in the northern maidan region, between 150 50'-170 28' north latitudes and 740 59'- 760 28' east longitudes and lies between two major rivers namely the Krishna and the Bhima. The district is bounded on the north by Sholapur district of Maharastra State, on the west by Belgaum district, on the east by Gulbarga district and on the south by Bagalkot district of Karnataka. Bijapur district is land locked district and is accessible both by rail and road. In the district, irrigation is carried out from surface water as well as from ground water. Nearly 12% percent of the geographical area in the district is under irrigation. Canals, tanks, wells, bore wells and lift irrigation are the important sources for irrigation. Ground water contributes nearly 68% of the total irrigation. There are 76,906 irrigation pump sets as on 31st March 2006 irrigating an area of 87,897 ha out of 1,28,590 ha. The canal irrigation in Shorapur taluk of Gulbarga district is through Indi canal of NLBC of

Tele:
E-mail addresses: Mallikarjun_yadawe@yahoo.com

Narayanpur project. Some of the areas of Basavana Bagewadi and Bijapur taluks are to be irrigated from the ALBC and Lift irrigation from the Almatti Dam in Basavana Bagewadi taluk of Bijapur district. Almatti and Narayanpur reservoirs submerge some of the areas of Basavana Bagewadi and Muddebial taluks respectively.water.

Sampling of water

Ground water sample collected from the Bore-wells, hand pumps and lakes of 30 sampling stations were analysed (Table.1). Samples were collected in clean Teflon bottles of 1 liter capacity. Highly pure quality chemicals and double distilled water was used for preparing solutions for analysis. Physical parameters like pH, TDS, were measured using digital meters immediately after sampling. The total hardness, alkalinity, nitrate and nitrites were analysed in the laboratory using standard methods[15].

Results and discussions

Table.1 presents an overview of ground water study area. In the studied localities were free from colour and odour. The pH values of ground water were varied from 7.10 to 8.5 indicating slightly alkaline nature. The slight alkaline nature of ground water may be due the presence of fine aquifer sediments mixed with clay and mud. In general the pH was within the limits of the standard values[15]. For drinking water, a pH range of 6.0 to 8.5 is recommeded[16]. The total dissolved solids (TDS) in drinking water reveal saline behavior of water. According to classification, only few samples were slightly saline category[17]. Total hardness varied from 204 to 2565 mg/l. Minimum (204mg/l) and maximum (2565mg/l) was reported from No.2 and NO.21 water samples respectively (Table.1). Water hardness in most of 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 ground water resulting results in urinary concretions, diseases of kidney or bladder or stomach disorder.

Alkalinity of water is measure of its capacity to neutralize acids. The alkalinity values provide guidance in applying proper doses of chemicals in water and waste water processes, particularly in coagulations, softening and operational control of anaerobic digestion. Jadhav et al found the alkalinity values varied from 94-212 mg/l at different sampling sites of Sonkhed Dam[18]. High alkalinity in water bodies leads to sour taste and salinity.

Nitrate of water samples collected lies in the range from 8.00 to 392 mg/l. About 50% of samples collected have high values of nitrate and exceeds the permissible limit proposed by BIS and WHO (45mg/l).The nitrite values ranged from 0.02 to 6.30 mg/l. Due to its solubility and anionic form, nitrate is very mobile can easily leach into the water table[19]. The most common sources of nitrate in ground water are atmospheric fallout, sanitation facilities, irrigational activities and domestic effluents[20]. Higher concentration of nitrate in water causes a disease called “methaemoglobinemia” or known as “Blue baby Syndrome”. It is particularly infant disease up to 6 months of child. To obtain an indication of the nitrate-nitrogen levels in drinking water in rural areas of upstate New York and the number of infants at risk for Methaemoglobinemia.

Nitrates and nitrites are indicators of remote and recent faucal pollution respectively. The results of investigations of Yang et al[21], showed that there is a significant positive association between drinking water nitrate exposure and gastric cancer mortality. In a study conducted in California an association between maternal preconception exposure to nitrate from drinking water and an elevated risk for an encephala was found[21]. An earlier Australian study also indicated an association between neural tube defects and nitrate[22]. Nitrate is mainly used in inorganic fertilizers[23,24]. Generally the nitrate concentration in our water samples reaches high levels as a result of agricultural run off, refuse dump run off or contamination with human or animal waste[4,25]. In contrast to surface waters, nitrate levels exceeded 10 mg/l in many of our ground water samples. A similar situation was observed in USA in 1986, where greater number of ground waters showed higher concentrations of nitrate than the surface waters[23]. Moreover initial wells could have significantly higher concentrations[11].

Ezeonu et al [26] suggested that nitrate in drinking water probably plays an important role in gastric carcinogenesis. There was a strong relationship between nitrate concentration and recurrent diarrhea,80% of the recurrent diarrhea causes were explained by nitrate concentration alone[27].Significant positive relationship with rainfall amount was also important. Southern Bijapur district is faced with a serious problem of potable water supply. The situation is even worst in villages, which lack public water distribution system. There is a need to evaluate these waters and develop strategies to reduce and prevent their contamination.

Conclusion

The total hardness of the ground water of southern Bijapur district area fall in the hard category. Higher concentration of nitrate in the study area indicates the sign of deterioration which calls for at least primary treatment of ground water before being used for drinking. The ground water quality improves with the increase in depth and distance of the well from the pollution source.

Table 1

S.NO	Village	pH	TDS In mg/L	Total hardness In mg/L	Alkalinity In mg/L	Nitrate In mg/L	Nitrites In mg/L
1	Araldinni	7.84	1720	680	204	8.00	0.02
2	Devapur	7.29	472	204	184	50.70	3.20
3	Arasangi	7.42	1881	1160	382	82.00	4.50
4	Koulagi	7.48	1286	1040	336	100.00	5.00
5	Akalawadi	7.40	1150	952	260	32.00	2.50
6	Utnal	7.50	1508	856	376	46.00	3.50
7	Yambatnal	7.60	1400	760	275	78.00	5.80
8	Donur	7.30	2152	1250	308	7.00	0.08
9	Golasangi(N)	7.46	2350	1476	324	94.00	1.20
10	Golasangi(S)	7.34	3490	2540	112	288.00	6.00
11	Nagardinni	7.14	535	304	222	4.50	0.80
12	Hebbal	7.10	1800	1224	380	192.00	3.80
13	Hunashyal	7.60	1690	1120	335	50.00	0.84
14	Huvinahipparagi	7.45	2380	1450	487	80.00	1.10
15	Ingleshwar	7.50	1465	1120	405	55.00	0.82
16	Kudarisalawadagi	7.10	2605	1925	330	164.00	2.40
17	Managuli	7.35	2300	1645	306	295.00	3.80
18	Uppaladinni	7.80	575	365	260	55.00	0.83
19	Nidagundi (LT)	8.20	1365	575	520	68.00	1.40
20	Chabanur	7.85	2690	900	400	100.00	2.00
21	Sasnur	7.90	4310	2565	460	392.00	6.30
22	Yalawar	8.50	3510	2240	540	68.00	1.00
23	Lingadalli	7.25	3020	550	150	35.00	0.81
24	Kuchabal	8.00	2100	600	410	85.00	2.40
25	Garasangi	8.50	1050	250	380	34.00	0.72
26	Malagaldinni	7.40	1365	460	220	18.00	0.08
27	Madakeshwar	7.70	1640	425	315	45.00	1.30
28	Madakeshwar	8.20	1095	345	480	28.00	1.22
29	Amaragol	7.50	1185	280	145	30.00	1.80
30	Nalatawad	7.30	1475	640	110	15.00	0.75

Although, the concentrations of few contaminants do not exceed drinking water quality represent a significant threat to public health.

References

1. Van Leeuwen, FXR. Safe drinking water; the toxicologists approach. Food and chemical Toxicology, 2000;38,551-558.

2. Khan M, Ihsanullah, sharafat T, Mehmud F, Sattar A, Occurrence of pathogenic microorganisms in food and water supplies in different areas of Peshawar, Nowshera and Charsadda., Pakistan Journal of Food Sciences,2000:10.3-4, 31-34.

3. Jacinthe P.A, Dick W.A, Brown I.C, Bioremidiation of nitrate contaminated shallow soils and waters via water table management techniques;evolution and release of nitrous oxide soil Biology and Biochemistry ,2000;32 (3)371-82.

4. Neal C,Neal M, Wickham H, HarrowM. The water quality of tributary of Thames. The pang Southern; Science of the Total Environment, 2000;251-252, (1-3);479-75.

5. Nolan B.T, Stoner J.D, Nutrients in Ground Wateers of the Conterminous United States, 1992-1995. Environmental Science and Technology 2000;34(7);1156-65. Kazmi s.s, Colicine typing and characterization of Shigella S.P. Isolated from food and water, M.Phil Disertation Department of Biological Sciences, Quaid-I-Azam University, Islamabad.1972.

6. Georg M.H, Wiklund L, Aastrup M, Pousette J, Thunholm B, Saldeen J et al, Incidence and geographical drinking water levels. Eur-J-Clin-Invest, 2001;31(12);1083-94.

7. yadawe M.S, Hiremath.D.M and Patil S.A, Assessment of fluoride content in ground and surface water and its environmental impact at B.Bagewadi and Muddhebihal taluka of Bijapur district, Karnataka India. E-Journal of chemistry,2010,7(2) 641-647.

8. Squiliancem P.J, Scott J.C, Moran M.J, Nolan B.T, Kolpin D.W, VOCs, Pesticides, nitrate and their mixtures in ground water used for drinking water in the United States. Environ.Sci,Technol, 2002,36(9);1923-30.

9. Gasteva P.D, Mardirosian. Z.H, Popova E.J, Iskrenova E.S, VladevaS.V,Pavlova K.I. Evaluation of health hazards in children from regions with nitrate pollution. Folia Med (plov div);2000;42(1),19-22.

10. Lehloesa L, Muyima N Y O, Evaluation of the impact of house hold treatment procedures on the quality of ground water supplies in the rural community of the Victoria district, Eastern Café; Technical note water S.A, 2000;26(2) 285-90.

11. Gelberg K.H, Church L, Casey G, London M, Roerig D.S, Boyd J et al, Nitrate levels in drinking water in rural New York state, Environmental Research, 1999;80(1);34-40.

12. Knobeloch L, Salna B, Hogen A, Postle J, Anderson H, (2000) Blue babies and nitrate contaminated well water (clinical conference), Environmental Health Perspectives, 108,7;675-678.

13. Niecko J, Sobotha M, Neicko K.V, Neicko M, (2001), The level of nitrates in drinking water wells situated in the Parish of Szydlowiel Pizegl-Lek, 58:Suppl 7,25-9.

14. Gulis G, Czompolyova G, Cerhan J.R,, (2002), An ecologic study of nitrate in municipal drinking water and cancer incidence in Trnava district, Slovakia, Environmental Research, 88, 3;182-187.

15. APHA, Standard methods for the analysis of water and wastewater, 18th edition. American Public Health association, Washington D.C 1998.
16. De,A.K, , Environmental chemistry (4th edition) New Delhi, India; New Age International Publishers, @002 (232).
17. Rabinove C.J, Long Ford R.H, and Brook Hart J.W, Saline water resource of North Dakotta U.S Geological survey water supply paper , 1958;1428-72.
18. Jadhav S.S, Surve P.R, Biradar R.G, and Ambore. N.E ,(2006) . Seasonal variation of physico-chemical characteristics of Sonkhed Dam water Aquacult, &,117-122.
19. Fetter C.W, Applied Hydrology 2nd edition Merrill Publishing Company, London 1988,p 592.
20. Ritzi R.W, Wright S.L, Mann B,and Chan M, Analysis of temporal variability in hydrogeochemical data used for multivariate analysis, Ground water , 1993;31;221-229.
21. Coren.L.A, Todoroff K.M, Shaw G.M,(2001), Maternal exposure to nitrate from drinking water and diet and risk for neutral tube defect. Smerican Journal of Epidemiology, 153,325-331.
22. Dorsh M.M, Scragg. R.K, McMichael A.J, Bghurt P.A, Dyer K.F ,(1984) Congenital Malformationa dn, Maternal drinking water supply in rural South Austrelia case control study, American Journal of Epidemiology., 119, 473-486.
23. WHO (1996) Guidelines for drinking water Quality (vol 2 2nd edition), World Health Organasation, Geneva, Switzerland.
24. London.M.K, Delin G.G, Komor S.C, Reagan C.P, (2000) Relation of pathways and transist times of recharge water to nitrate concentrations using stable isotopes, Ground Water, 38,3, 318-395.
25. Kuzmi S.S, Colicine typing and characterization of Shigella sp, Isolated from food and water, M.Phil Desrteration, Department of Biological Sciences, Quaid-I-Azam University, Islamabad, 1992.
26. Ezeona.F.C, Egboka B.C.E, Okaka A.N.C, (1992) , Nitrate and nitrite in somenon-alcoholic beverages and water supplies in Onitsha, Nigeria, Journal of Food Science and Technology, 29,5, 329-330.
27. Gupta.S.K, Gupta.R.C, Gupta A.B, Seth A.K, Bassin J.K., Gupta A. Sharma M.L (2001), Recruitment diarrhea in children living in areas with high levels of nitrate in drinking water, Arch,Environ.Health, 56 (4); 369-73.