

Assessment of concentration of fluoride in ground water: A-Review

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ABSTRACT

Now-a-day pollution of ground water is serious problem due to industrial activities and human activities. If such polluted ground water used for drinking purpose and domestic purpose it hazards the health. To check quality of ground water, physico-Chemical analysis of ground water samples carried out for different study area by different researcher. From data collected by various research papers, it was observed that due to high concentration of fluoride in ground water used for drinking purpose, the peoples from study area are affected by dental fluorosis and skeletal fluorosis.

KEY WORDS: Physico- Chemical, Ground Water, Dental Fluorosis, Skeletal Fluorosis.

1. INTRODUCTION

Water plays an important role for all living organism. Due to rapid industrialization, urbanization, agriculture activity and different human activities pollution of ground as well as surface water increases. Physico-chemical analysis of ground water is carried out by studying different parameters such as pH, E.C., TDS, total alkalinity, total hardness, calcium, magnesium, chloride, fluoride. Fluoride is element of halogen group, it is an important element for life but fluoride (F) becomes toxic when it occur in excess in drinking water, maximum permissible limit of 1.5 PPM (WHO standards). Fluorosis of teeth affects the dental enamel. Fluorine intoxication through drinking water containing above 10 PPM of fluorine result skeleton fluorosis. Skeletal fluorosis and dental fluorosis are caused by excess of fluoride ion intake from food or drinking water (Santhi, 2012).

2. MATERIAL AND METHODS

The search terms – physico-chemical status of ground water, water quality index of ground water, skeletal fluorosis and dental fluorosis were used to search for relevant articles from referred and index journals.

3. RESULT AND DISCUSSION

The review of the finding various research papers demonstrated that various physico-chemical parameters of drinking water were analyzed from different study area, to check quality of drinking water. Dental fluorosis and skeletal fluorosis are caused by excess of fluoride ion intake from food or drinking water so it is important to analyzed concentration of fluoride ion from drinking water. Literature Review: We referred several research papers related to physico-chemical analysis of ground water as well as surface water of different districts and cities. Different physico-chemical parameters are compared with WHO standards to determine the quality of water suitable or not suitable for drinking purpose, irrigation purpose and domestic purpose. The concentration of fluoride ion is determine from drinking water to find percentage of villagers are suffering by fluorosis due to high concentration of fluoride in drinking water. Santhi (2012), In this paper concentration of fluoride in the ground water and different physico-chemical parameters present in ground water samples from three villages of Tirunelveli District were analyzed by standard procedure maintained in Shanti (2012), then following result were obtain. The pH of ground water samples were within limit (6.38 to 8.37) Electrical conductance of sample ranged from 86 to 920 mho/cm. Total hardness of ground water ranged from 110 to 420 PPM. Most of samples of ground water above permissible limit. The amount of chloride ranges from 26.27 to 400 PPM. 50% of water samples have been found to above desirable limit. The concentration fluoride in ground water samples from three villages of Tirunelveli District was found in the range of 0.9 PPM to 4.3 PPM. 44% of peoples have been affected with dental fluorosis and traces of skeletal fluorosis. The concentration of fluoride present in drinking water in 1 PPM is the safe limit prescribed by Indian Council of medical Research and committee on Public Health Engineering Manual and code of practice and world health organization. To overcome this difficulty people should consume water from control areas (Radha Gautam, 2011). They have been selected 46 ground water samples from 27 villages of eastern south eastern and southern zone of Nawa Tehsil in Nagour district of Rajasthan State where ground water is the major source of water supply. Analysis of ground water samples were carried out to study various physico-chemical parameters as well as fluoride content. Physico-chemical parameters such as pH, TDS, E.C, alkalinity, TH, Calcium, magnesium, chloride were analyzed by using standard techniques in laboratory. Fluoride concentration of ground water samples from eastern, south Eastern and south zone analyzed with the help of orion Research ion Analyzer model 407 A. Following result were obtain the fluoride concentration in the three different zones ranged from 0.64 to 14.62 mg/l where 13.04% samples were found within permissible limit while 86.96% found fluoride beyond permissible limit ($>1.5\text{mg/l}$) Fluoride concentration ranges from 0.64 to 3.63 mg/l in southern zone while fluoride concentration ranges from 1.52 to 5.13 mg/l in the eastern zone. In south eastern zone fluoride concentration ranged between 1.10 to 14.62 mg/l was under serious fluoride contamination, other physico-chemical parameters also studied, pH ranges from 7.28 to 9.78, electrical conductivity

ranges between 1430 to 3976 $\mu\text{mho cm}^{-1}$, TDS varies from 1020 to 6420 calcium content ranges between 3.20 to 769.53 mg l^{-1} whereas magnesium content was ranges from 2.90 to 643.79 mg l^{-1} . Total hardness was recorded between 20 to 4560 mg l^{-1} while alkalinity was between 190 to 3100 mg l^{-1} . After analyzing physico-chemical parameters and fluoride concentration in ground water of Nawa tehsil it can concluded that ground water get polluted with high amount of fluoride causes dental and skeletal fluorosis. Vartika Rai (2014), this paper evaluate and summarized the result of concentration of fluoride ion in drinking water of Lucknow city, India. Twenty different localities were selected in and around Lucknow city to collect water samples of bore and supply water of Municipal Corporation. The fluoride level were measured by the standard method of measuring fluoride level in water as recommended by using ion-selective electrode. It was found that the fluoride concentration in all drinking water samples are higher in summer months and shows little dilution of fluoride concentration in ground water during rainy season. Most of the area of Lucknow city shows concentration of fluoride ion within the permissible limit while Bakshi Ka Talab area where ground water is used, higher level of fluoride content, these people are vulnerable to fluoride toxicity. So it is necessary to provide piped water for drinking purpose. Sunita (2013), this paper focus on the fluoride concentration in ground water in and around Badvel, Kadapa District, Andhra Pradesh. Where only ground water is source of water for drinking purpose. Twenty five ground water samples were collected from twenty five different location in and around Badvel, Kadapa district, Andhra Pradesh. These ground water samples were analyzed pH were measured by pH meter, E.C. were measured by conductivity meter., TDS by TDS meter Ca^{2+} , mg^{2+} , CO_3^{2-} , HCO_3^- , Cl^- , TH were measured by titrimetry and fluoride were measured by using ion selective electrode. Concentration of fluoride in ground water samples from study area ranges from 0.5 mg/l to 7.2 mg/l. About 24% of ground water samples are exceeding the permissible limit of fluoride for drinking water causes fluorosis. To overcome this difficulty it is necessary to provide ground water used fit for drinking purpose. Bhagirathi Behera (2014), In this paper physico-chemical parameters such as pH, E.C., TDS, TH, Ca^{2+} , Mg^{2+} , SO_4^{2-} Total alkalinity and F^- concentration were analyzed for study area i.e. Purulia district, West Bengal, India. Recognized as fluoride affect area samples of ground water were collected from study area during month of January, 2013. The analysis of ground water samples were carried out by standard method. pH by pH meter, E.C. by E.C. meter, Cl^- by titrimetric method Na^+ , K^+ by flame photometer, SO_4^{2-} by turbidity meter total hardness by trimetric method, fluoride by ion selective electrode (APHA 1991) The pH ranges from 6.55 to 9.11, TDS observed up to 1500 mg/l due to high TDS value laxative effect is observed. Total hardness of water sample were ranges from 40 mg/l. Total hardness leads to heart diseases and kidney stone formation. Cl^- ranges from 25 mg/L to 380 mg/L. High Cl^- content due to soluble chlorides from rocks. The alkalinity ranges from 70mg/L to 570 mg/L. The high alkalinity gives sour taste and salinity to water. Fluoride concentration varies from 0.126 PPM. Only 59% villages shows fluoride content within permissible limit (>1.5 mg/L) and 41% of villages have high fluoride content. Long term effect of excess of fluoride content through ground water used for drinking purpose causes the dental fluorosis and skeletal fluorosis. Kausik Kumar Das (2012) this paper analyzed the concentration of fluoride in ground water of different villages of Patripal panchalyat, Balasore District, Odisha. Where ground water is only source of water for drinking purpose. Total 26 ground water samples were analyzed by using SPAND reagent and acid zirconium chloride by spectrophotometer at 570nm to determine the F^- concentration. The value of F^- ranges from 0.6mg/L to 5.83mg/L. 21 ground water samples out of 26 shows fluoride content above permissible limits of WHO and BIS. High concentration of fluoride in drinking water causes dental fluorosis and skeletal fluorosis. It was found that 70% villagers are suffering by fluorosis due to high concentration of fluoride in drinking water.

4. CONCLUSION

From above paper we have concluded that due to high concentration of fluoride in the ground water used for drinking purpose, the peoples from study area are affected by dental fluorosis and skeletal fluorosis.

REFERENCES

- Bhagirathi Behera, Naveen Kumar and Mrutyujay Moharana Assessment of ground water pollution due to fluoride concentration and water quality in and around Purulia district, west Bengal, India. J. Chem. Pharm. Res, 6 (8), 2014, 384 -392.
- Kasik Kumar Das, Tanuja Panigrahi, Pannda R.B, Occurrence of fluoride in ground water of Patripal panchayat in Balasore District, Odisha, India, Journal of environment, 1 (2), 2012, 33-39.
- Radha Gautam, Nagendra Bhadwaj, Yashodasaini, Study of fluoride content in ground water of Nawa Tehsil in Nagour, Rajasthan, Journal of environmental biology, 32 (1), 2011, 85-89.
- Santhi D, Occurance of fluoride in ground water and ground water quality in rural area of Triunelveli District, Poll. Res, 31 (1), 2012, 99-101.

Sunita V, Abdullah Khan J, Muralidhara Reddy B, Fluoride concentration in ground water in and around Badvel, Kadapa District, Andhra Pradesh, Indian journal of advance in chemical science, 2 (1), 2013, 78 -82.

Vartika Rai and Munna Singh, Fluoride concentration in drinking water of Lucknow city, India -A case study, Hydrology current res, 5 (4), 2014, 2157.