



International Journal of Chemistry and Pharmaceutical Sciences

Journal Home Page: www.pharmaresearchlibrary.com/ijcps



Research Article

Open Access

The Assessment of Fluoride levels in Ground Water of Mydukur Municipality of YSR Kadapa Dt., A.P, India

A. Ramesh Babu*¹, S. Pavan Kalyan¹, P. Suresh¹, B. Rajeswari¹, M. V. Hari Prasad¹,
B. Muralidhara Reddy² and V. Sunitha²

¹Dept. of Chemistry, SCNR Govt. Degree College, Proddatur, YSR Kadapa dist, A.P, India

²Dept. of Geology and Geo informatics, Yogi Vemana University, Kadapa, A.P, India

ABSTRACT

Potentiometric analysis is used for the determination fluoride levels in the ground water of Mydukur municipality. Fluoride ion selective electrodes is used to determine fluoride concentrations in ground water due to its high selectivity, specificity and low detection limits. A total of ten samples from different locations of Mydukur municipality area are tested in the laboratory. Fluoride levels in the study are exceeds the WHO permissible limits (0.5-1.5mg/L). The fluoride levels study area ranges from 1.59 – 4.4 mg/L with an average of 2.467 mg/L.

Keywords: Fluoride, Ground water, ISE, Fluorosis, Mydukur.

ARTICLE INFO

CONTENTS

| | |
|------------------------------------|----|
| 1. Introduction | 41 |
| 2. Experimental. | 42 |
| 3. Results and Discussion. | 43 |
| 4. Conclusion. | 43 |
| 5. Acknowledgment. | 43 |
| 6. References | 43 |

Article History: Received 25 November 2015, Accepted 29 December 2015, Available Online 27 January 2016

*Corresponding Author

A. Ramesh Babu
Department of Chemistry,
SCNR Govt. Degree College,
Proddatur, YSR Kadapa, A.P, India
Manuscript ID: IJCPS2824



PAPER-QR CODE

Citation: A. Ramesh Babu, et al. The Assessment of Fluoride levels in Ground Water of Mydukur Municipality of YSR Kadapa Dt., A.P, India. *Int. J. Chem, Pharm, Sci.*, 2016, 4(1): 41-44.

Copyright© 2016 A. Ramesh Babu, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

1. Introduction

Ground water is major drinking water source in the world wide India has no exception to this; contamination of drinking water may effect the development of any nation. Fluorine is most electronegative element hence never found in nature as fluorine. Fluoride occurs in combined form of International Journal of Chemistry and Pharmaceutical Sciences

minerals as fluoride and represents 0.06 to 0.09% of the earth crust. Fluoride is found more frequently in different sources of water but with higher concentrations in groundwater due to the presence of fluoride-bearing minerals like fluorite, apatite, mica, amphiboles, certain

clays and [1-2]. Fluoride occurs in almost all water from trace to high concentrations. Fluoride concentration in natural water depends on various factors such as temperature, pH, solubility of fluoride bearing minerals, anion exchange capacity of aquifer materials (OH for F) and nature of geological formation and contact time of water with particular formation. Water contains many inorganic ions like calcium, magnesium, sodium, fluoride, chloride, sulphate, nitrate etc. Among the other ions fluoride has unique property due to the high electronegativity of fluorine. The lower (0.5mg/L) and higher (1.5mg/L) prescribed limits are very important in human health point of view. Fluoride in minute quantity is an essential component for normal mineralization of bone, teeth and formation of dental Enamel [3, 4]. Very low doses of fluoride (less than 0.5 mg/L) in water promote tooth decay. However, when consumed in higher doses (more than 1.5 mg/L), it leads to dental fluorosis or mottled enamel and excessively high concentration (above 3.0 mg/L) of fluoride may lead to skeletal fluorosis [5, 6].

For this reason periodical monitoring of fluoride levels in drinking water is very essential. Most of the fluoride contaminations in water is natural, fluoride pollution is major drinking water problem in many countries like Argentina, U.S.A., Algeria, Libya, Turkey, Iran, China, Australia, south Africa, Kenya, Iraq, Srilanka, Canada, Thailand, Newzealand, Japan and India has no exception [7]. The health problems arising as a result of fluoride contamination are more wide spread in India. The problem of excessive fluoride in ground water in India was first reported in 1937 in the state of Andhra Pradesh [8]. Today fluorosis is a major public health problem in many state of India. Nearly 177 districts have been confirmed as fluoride affected area. Recent studies show approximately 62 million People including 6 million children suffer from fluorosis because of consumption of water containing high concentration of fluoride.

In Andhra Pradesh, some areas in Prakasam [9], Anantapur [10, 11] and Kadapa [12] districts suffering from fluoride problem. The some parts of kadapa district are highlighted in groundwater quality problem of fluoride contamination. The Groundwater is the primary source of drinking water in most parts of the district. Geologically limestone is the most predominant rocks of the whole kadapa area these rocks have fluoride bearing minerals which are leached out to the groundwater and contribute high fluoride concentration in the groundwater. Mydukur Municipal Town in YSR Kadapa district is located in Andhra Pradesh. Most of the people in the study area are depends on ground water for drinking and agricultural purpose. Thorough literature survey reveals that no reports are available on the fluorides levels in this area. Samples are collected in ten different locations of Mydukur Municipality area and analysed by Ion Selective Electrode Potentiometric method.

2. Experimental

2.1 Study Area: Mydukur Municipal Town in YSR Kadapa district is located in Andhra Pradesh. The area is International Journal of Chemistry and Pharmaceutical Sciences

located at latitude of 14.7295N and longitude of 78.734E. This is dominantly an arenaceous consisting of conglomerate quartzite, Quartzite with shale formation of dolomitic limestones. The main factors that control the quality of water are associated with lithology and soil. Water quality may vary depending upon variations in geological formations.



1(a): Andhra Pradesh



1(b): Mydukur, YSR Kadapa dist

2.2 Methodology

Ten samples from different locations of Mydukur were collected in previously washed polyethylene bottles in the month of November, 2015. The samples were collected from bore wells which were extensively used for drinking and other domestic purposes. The ground water samples are analysed by Ion Selective Electrode method.

2.3 Fluoride Ion Selective Electrode Method

Potentiometric determination of fluoride content in solutions by usage of the fluoride electrode [13, 14] is simple, cheap and reliable. Fluoride selective electrode is very selective to fluoride ion but on the other hand hydroxide ion present in the solution may interfere. Adjustment of pH value with buffer is necessary because fluoride and hydroxide ions have the same electricity and similar ion radius. This interfering effects eliminated by usage of TISAB buffer. Instrument is calibrated using

standard fluoride solutions before conducting the experiment.

3. Results and Discussion

3.1 Fluoride Sources and Geological Influence

Fluoride incidence in groundwater is mainly a natural phenomenon, influenced basically by the local and regional geological setting and hydro-geological conditions. The chief sources of fluoride in groundwater are the fluoride-bearing minerals in the rocks and sediments. The important fluorine-bearing minerals are fluorite, apatite, certain amphiboles and micas. The concentration of fluoride in groundwater is limited due to the low solubility of most fluorides. The solubility values of sodium fluoride, magnesium fluoride and calcium fluoride at 18 °C are 42,200 mg/L, 87 mg/L and 15 mg/L respectively. Magnesium fluoride is more soluble than calcium fluoride. Sodium fluoride is very soluble.

3.2 Fluoride levels in the study area

Results from groundwater of study area suggest that (figure 2 and Table 1) the fluoride content in the most of locations in the study area are exceeds the permissible limits. The lowest value (1.59mg/L) which is in sample no. S6 is also has slight deviation from maximum fluoride limit. The highest fluoride level (4.40mg/L) is observed in sample no. S3. The average fluoride level in the study area is 2.467mg/L.

Table 1: Sample locations with fluoride levels

| S.No | Sample location | Fluoride levels (mg/L) |
|------|--------------------|------------------------|
| S1 | Near Lakshmi plant | 2.64 |
| S2 | Proddatur road | 2.34 |
| S3 | Badvel road | 4.40 |
| S4 | Ankalamma Temple | 2.61 |
| S5 | VN Puram | 2.40 |
| S6 | Akkulayapalle | 1.59 |
| S7 | Settyvaripalli | 1.74 |
| S8 | PS palli west | 2.73 |
| S9 | PS Palle north | 1.97 |
| S10 | Sainath puram | 2.25 |

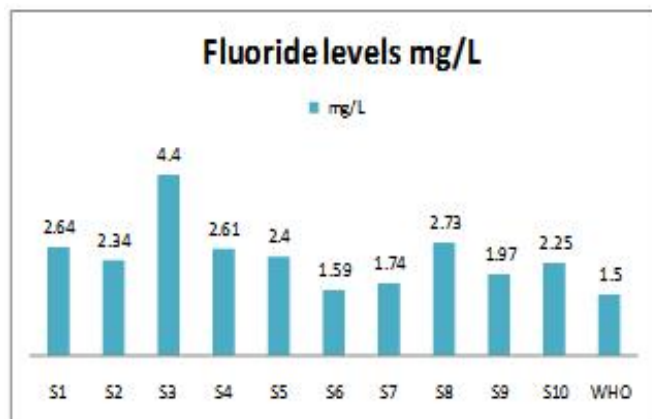


Figure 2: Fluoride levels in the study area

4. Conclusion

Fluoride concentration in the ground water of Mydukur area was determined by Ion Selective Electrode method. Ten ground water samples of different locations of study area are collected and analysed. From the data it is found that fluoride levels in all samples are exceeds the WHO and ISO permissible limits. It shows that the ground water in the study area is not suitable for drinking water without proper defluorination or proper filtration process.

5. Acknowledgment

The authors A.R, S.P, K. P.S, B.R and M.V.H.P are thankful to Dr. M. Subbi Reddy, Principal, SCNR Govt. Degree College, Proddatur for giving permission and encouragement to conduct this study.

6. References

- Bell, M. C.; Ludwig, T. G. The supply of fluoride to man: ingestion from water, fluorides and human health, W.H.O (1970) *Monograph series 59*, World Health Organization, Geneva.
- Meenakshi, V. K.; Garg, K.; Renuka; Anju M. Ground water quality in some villages in Haryana, India: Focus on fluoride and fluorosis. *Journal Hazardous Material* **2004**, 106 B, 85-97.
- Fejerskov, O. Fluoride in Dentistry, *Iowa State Press, Ames, IA, USA, 1996*.
- Castioni, N. V.; Baehni, P.C.; Gurny, R. Eur. J. Pharm. Biopharm, **1998**, 45, 101.
- Myers, H.M. Florides and Dental Fluorosis, *Karger Publishers, Basel, 1978*.
- Nicolay, A.; Bertocchio, P.; Bargas, E.; Coudoré, F. G. Chahin, Al.; Reynier, J. P. Clin. Chim. Acta, **1999**, 29, 281.
- Fawell, K.; Bailey, J.; Chilton, E.; Dahi, L.; Fewtrell.; Magara, Y. Fluoride in Drinking-water, WHO, **2006**.
- Short, H.E., McRobert, G.R., Bernard, T.W.; Mannadiyar, A.S. Endemic fluorosis in the madras presidency. *Ind.J.Med.Res*, **1937**, 25, 553-561.
- Venkata, M. S.; Nikhila, P.; Reddy. S. J.; Determination of fluoride content in drinking water and development of a model in relation to some water quality parameters. *Fresenius Envir Bull*, **1995**, 4, 297-302.
- Sunitha, V.; Muralidhara, R. B.; Ramakrishna, R. M. Variation of fluoride and correlation with alkalinity in groundwater of shallow and deep aquifers- A case study in and around Anantapur district, Andhra Pradesh *Int. Journal of Applied Sciences and Engineering Research* **2012**, 1, 4, 569-575.
- Muralidhara, R. B.; Sunitha, V.; Ramakrishna, R. M. Fluoride and Nitrate Geochemistry of Groundwater from Kadiri, Mudigubba and Nallamada Mandals of Anantapur District, Andhra Pradesh, India. *Journal of Agricultural Engineering and Biotechnology*, **2013**, 1, 2, 37-42.

12. Sunitha, V.; Abdullah, K. J.; Muralidhara, R.; B. Fluoride Contamination in Groundwater in and Around Badvel, Kadapa District, Andhra Pradesh, *Indian Journal of Advances in Chemical Science* , **2013**, 2,1: 78-82.
13. Frant, M.; Ross, J. W.; Jr. *Science*, **1966**, 154, 1553.
14. Frant, M.S. History of the Early Commercialization of Ion-Selective Electrodes, *Analyst*, **1994**, 199: 2293-2301.