REVIEW ON CHEMICAL AND BIOLOGICAL ASPECTS OF HARDNESS IN WATER

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ABSTRACT

Water is one of the most essential natural resource for existence of life on this planet. With increasing human population and rapid development, the global water consumption demand have been increased many folds and physico-chemical and microbiological parameters of large proportion of the water sources have been altered due to anthropogenic activities. Physico-chemical parameters are influenced by both geogenic and anthropogenic agents. Hardness of water is one of them. Hardness is an essential parameter for drinking water from both aesthetic and quality aspects. A common source of natural pollutants in groundwater is the dissolution of minerals in some aquifers under certain physical conditions. Water having very high amount of minerals is reported to be detrimental to human health. Several epidemiological investigations have demonstrated the relation between hardness of drinking water and risk for cardiovascular disease, cancer, growth retardation, reproductive failure, and other health problems. It is therefore requisite to assess drinking water quality parameters at regular interval for preventing diseases and improving quality of life. This review is an attempt to explore the causes and effects of its constituents (calcium and magnesium) on humans and animals.

Key words: Hardness, calcium, magnesium, cardiovascular, drinking water, health

INTRODUCTION

Water quality assessment is of vital concern as it is directly linked to human welfare and the definition of water quality depends on the desired use of water (Kirda 1997, Jain et al. 2009). Consumption of deteriorating water quality affects livelihoods at risk (Leeavathi et al. 2016). Groundwater quality is affected by both geogenic and anthropogenic agents (Sheikhy et al. 2014). About 70% of Earth’s surface is covered by water of which 97.5% is salty and 2.5% is freshwater. Less than 1% of this 2.5% amount of freshwater is accessible (Mishra and Dubey 2015). Groundwater accounts for about 98% of global freshwater on the Earth (Kibona et al. 2009, Cassardo and Jones 2011, Lui et al. 2011) which is used by approximately 2.5 billion people worldwide for their daily needs (Margat 2008, Margat and van der Gun 2013). Total global population is reported to be 7.6 billion, out of which 1.1 billion people in the world, or 15% of the global population lack access to safe drinking water (Sobsey 2006). Chemical characteristics of the groundwater are influenced by rock-water interactions and several anthropogenic factors (Alfy et al. 2017). A common source of natural pollutants in groundwater is the dissolution of minerals in some aquifers under certain pH and redox conditions (Rasool et al. 2015, Singh and Mukherjee 2015). The dominant factors in controlling the groundwater hydro geochemistry are chiefly evaporation and weathering (Ghalib 2017). Furthermore, increased use of chemical fertilizers to improve agricultural yields enhanced groundwater pollution (Bouzoura et al. 2015, Milhome et al. 2015, El Alfy and Faraj 2016).

One of the major causes of health issues in the developing countries is largely due to lack of safe drinking water (Cairncross and Valdmani 2006). Due to expansion in human population, intensive industrialization, excessive use of fertilizers in the agriculture and other human activity water is highly polluted with harmful contaminants (Patil et al. 2012, Nag and Lahir 2012). The groundwater is reported to be comparatively clean and free from pollutants than surface water but prolonged discharge of industrial effluents such as glass and porcelain industries, enamel industries, steel industries, domestic sewage and solid waste dump caused groundwater pollution and raised human health issues (Raja et al. 2002). Those water sources that do not conform the national standard result in human health problem in long time exposure (Alemu et al. 2015). It is necessary that the quality of drinking water should be checked at regular time interval because due to use of contaminated drinking water, human population suffers from varied water borne diseases (cholera, typhoid, diarrhea etc.).

Water is essential for life. But water having very high degrees of hardness is reported to be harmful to human health (Ramya
Oral/poster presentation in national and international seminars/ conferences

1. A review on physico-chemical and biological characteristics of ground water, held at Vaish College, Bhiwani, 16 March, 2013

2. A review on physico-chemical properties and potability of ground water and surface water in rural Haryana, held at Dept of Environmental Sciences, MDU, Rohtak, March 26, 2014.


4. Impact of climate change on water resources in India, held at Ch. Bansi Lal University, Bhiwani, January 16, 2016.