Magnesium and Calcium Concentrations in Drinking Water Supply Systems – Survey Results, September 2023

ABSTRACT

Israel is one of the global leaders in the field of water desalination and in the relative proportion of desalinated water in the drinking water supply system. The majority of the population in Israel lives in areas where drinking water sources are impacted by desalination. During the desalination process, minerals are removed and a stabilization step is required via addition of calcium (hardening process). Consumption of drinking water with low mineral content, magnesium in particular, can have serious health effects, as water is an important source of minerals. Magnesium deficiency is associated with an increased risk of arrhythmia, that can lead to morbidity and even death as a result of myocardial infarction, and is also linked to an increased risk of diabetes. Magnesium deficiency is also associated with an increased risk of osteoporosis, intestinal cancer, hypertension and obesity.

The Drinking Water Regulations (2013) include a requirement to assess the costs and practical achievability of adding magnesium to desalination water by 2018, but for various reasons the assessment was not completed. It is important to collect representative data on magnesium and calcium concentrations in the local supply systems, in order to assess population magnesium and calcium intake through drinking water. This survey aimed to measure magnesium and calcium concentrations at representative points in the drinking water supply system, and to estimate the geographical and seasonal variation in magnesium and calcium concentrations in drinking water.

The survey included 225 sampling points that represent about 72 cities in local councils and cities, and about 60 communities in 26 regional councils. Some of the points were sampled in different supply periods (February-March/May-June-July/November-December). In about 58% of the sampling points, magnesium

concentrations were lower than 20 mg/L, while the average concentration was 18mg/L. Of the 30 largest cities (inhabiting about 60% of the population), in 10 the average magnesium concentration in 2023 was lower than 10 mg/L, including the two largest cities in Israel, Jerusalem and Tel Aviv; in 23 cities the concentration was lower than 20 mg/L. In general, higher magnesium concentrations were measured in the North and East of the country, where there is less desalinated water in the system. On the other hand, in the Southern and Ashkelon districts, the average magnesium concentration was lower than 10 mg/L, due to a more significant contribution of desalinated water to the supply system in these areas. In Tel Aviv, Jerusalem, Central and Haifa districts the average magnesium concentration was lower than 20 mg/L. Also, in some of the cities, there was seasonal variation in magnesium concentrations in drinking water, depending on the dominant source to the water supply system (groundwater/surface water/desalination).

Survey results indicate that calcium concentrations in drinking water are above 30 mg/L in almost all parts of the country. This finding is not surprising as the regulations require addition of calcium to desalinated water (at a concentration higher than 80 mg/L as $CaCO_3$, equivalent to 32 mg/L Ca). Calcium is also present in high concentrations in most of the groundwater used for drinking in Israel, on average over 80 mg/L Ca.

The results of the survey, which indicate low concentrations of magnesium in drinking water is several large cities in Israel, emphasize the importance of adding magnesium to desalinated water to prevent disease. It is important to complete the assessment to identify the appropriate method for adding magnesium to desalinated water. The Ministry of Health is promoting an amendment to the Drinking Water Regulations that would allow water suppliers to add calcium and magnesium to supplied drinking water. In addition, the Ministry of Health is cooperating with the Water Authority and Mekorot to establish a pilot facility to assess the practical achievability and cost of adding magnesium to desalinated water.

In light of the survey findings, it is important to raise public awareness about the nutritional benefits of magnesium rich foods, and to conduct epidemiological research linking magnesium concentrations in drinking water to incidence/ prevalence and mortality rates of diabetes and stroke.