Research Paper

Hydrogeomorphology, Vol. 10, No. 34, Spring 2023, pp (18-20)

Received: 2022.12.27
Accepted: 2023.03.18

Nitrogen Compounds in Drinking Water Sources in the Maku-Bazargan-Poldasht Aea Are Being Studied for Their Non-carcinogenic Possibility

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1-Introduction

Nitrate is one of the pollutants of drinking water sources in the Maku-Bazargan-Poldasht region as a result of human and agricultural activity. According to research, the maximum nitrate content in the Maku-Bazargan-Poldasht region's water resources has increased from 33 mg/L to 167 mg/L at the regional level since 2000, or 15 years ago. The drinking water in this area comes from a mix of Wells, Springs, Qanats and Surface water. The results of this investigation, which collected samples from a range of water sources, show that the area has a significant level of water source contamination. This is the first study to look at the non-carcinogenic risk of nitrogen compounds, which are plentiful in the study area. Because of the high concentrations of nitrogen compounds in the research area, this is the first study to determine if nitrate, nitrite, and ammonium are non-carcinogenic. The current study aimed to assess the amounts of nitrate, nitrite, and ammonium in drinking water sources in the Maku-Bazargan-Poldasht region and look into any potential health risks associated with nitrate and nitrite. This was done in accordance with USEPA guidelines. This study made an effort to present a non-carcinogenic nitrogen compound risk map, and if such a risk exists, further research by scientists should focus on it and identify the best course of action.

2-Methodology

In this study, 60 water samples were collected from springs, wells, and surface water sources in the area, including rivers, and were analyzed alongside hydrogeological data received from the West Azerbaijan Province's regional water organization. The bulk of the major and minor ions had values that exceeded USEPA guidelines. The major issues of this study are the anomalies of nitrogen compounds (nitrate, nitrite, and ammonium)

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and their impact on the health of the local people. Minor element anomalies (nitrite, nitrate, and ammonium) were found in the area, according to the data.

3-Results and Discussion

The primary goals of risk assessment are to identify the hazards associated with each chemical element, measure the level of exposure to dangerous or toxic chemicals, and predict the potential unfavorable effects of exposure to these chemicals (USEPA, 2014). Using a reference dose value and an average dosage value, the hazard index approach was developed to assess the non-carcinogenic impacts of several potentially risks non-carcinogenic chemicals. The daily exposure dosage (ADD) is calculated while taking into consideration the duration, degree, and sequence of pollutant exposure in the body. The risk index, which is the sum of all HQ computed for each anomalous element, can also be used to calculate non-carcinogenic risk for human health via a number of elements (USEPA, 2014). The reference dose compresses a lifetime of continuous, daily exposure to the human population with slight risk of harm. It should be noted that the reference levels for nitrate and nitrite are 1.6 and 0.1 mg/kg per day, respectively, and that if the hazard ratio (HQ) is less than one, the population is considered safe and not exposed to health problems (US Environmental Protection Agency, 2014). The final value for non-carcinogenic risk assessment is the risk index sum of the risk factors for each element. In this evaluation, children's HQ scores ranged from 0.0057 to 4.3, while adults' HQ levels ranged from 0.0045 to 3.4. Since that children's body weight is lower than that of adults, the estimated risk factor for children is also higher than that of adults. According to this study, children are also more likely than adults to be exposed to non-carcinogenic risk. According to the health hazards connected with nitrogen compounds, both adults and children will be at risk (HI > 1), and children are more vulnerable than adults, with newborns being particularly vulnerable. The majority of the samples appear to be unsafe for human consumption because, according to the health risks associated with nitrogen compounds, both adults and children are at risk (HI > 1), and children are more vulnerable than adults, with newborns being the most vulnerable category due to ingesting and drinking.

4-Conclusions

A complex aquifer system exists in the Maku-Bazargan-Poldasht region (Alluvial-Karst-Basalt). In November 2021, 60 samples were collected from the complex aquifer, surface water sources, springs, and a Qanat with suitable dispersion. According to the study, nitrate, nitrite, and ammonium analyses for the major, minor, and trace elements were several times higher than the standard for the minor elements that were also evaluated for nitrogenous compounds. In fact, determining the effects of these factors is the primary

purpose of this study. The Human Health Risk Assessment is the most effective tool for determining how water quality affects the health of residents. Water sources in the Maku-Bazargan-Poldasht area have been found to contain nitrogen compounds (nitrate, nitrite, and ammonium), which are harmful to residents' health. The health risk results indicated a high possibility of non-carcinogenic disease issues as a result of adults and children being exposed to high quantities of nitrogen compounds through drinking water. In addition, children were found to be more vulnerable than adults. There is a higher risk for non-carcinogenic changes, according to the final map of the non-carcinogenic risk linked with drinking. It indicates the presence of high risk in the north-west and south-east parts of the study area. The most significant risk is associated with the downstream regions and the drainage basin, which is a completely alluvial aquifer with significant agricultural operations. As a result, HI exceeds the USEPA's non-carcinogenic chemical threshold.

Keywords: Nitrate, Nitrite, Ammonium, Non-carcinogenic, Human Health Risk Assessment, Maku-Bazargan-Poldasht, Northwestern Iran

Acknowledgments: "This work has been supported by the Center for International Scientific Studies & Collaborations (CISSC), Ministry of Science Research and Technology of Iran"

5-References

USEPA (2014). Risk Assessment Guidance for Superfund (Human Health Evaluation Manual). USA, North of Iran.