

Estimation of Magnesium in Water by Flame Atomic Emission Method in Some Water Areas of Babylon Governorate

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Annotation: Magnesium is an essential element and an important mineral that plays a vital role in numerous bodily functions. It is necessary for maintaining muscle relaxation, proper nerve functioning, and regular heartbeats, as well as facilitating the blood clotting process. This significant mineral is recommended for daily intake to help maintain overall well-being and promote a sense of calm throughout the day. However, it is critical to be aware that excessive consumption of magnesium can lead to complications by inhibiting the absorption of other vital elements. The accumulation of these elements in the body can eventually reach toxic levels, posing serious health risks. Therefore, it is important to establish a distinct quality assurance standard to ensure that the levels of this mineral do not exceed safe limits in drinking and irrigation water. This study thoroughly examined the infringement of maximum concentration levels of magnesium in various locations throughout the Babylon Governorate. This research is essential not only for environmental integrity but also for safeguarding public health and ensuring the safety of the community.

Water analysis has been widely employed to meticulously assess the concentration of various elements, the overall quality, and to evaluate its physical and chemical specifications. This process is crucial for determining the effectiveness of treated water, as well as for assessing the wear and corrosion conditions within pipes. There exists a multitude of methodologies through which the elements found in water samples are identified; however, the focus of this particular study was primarily on employing flame atomic emission technology, which is a sophisticated technique that enables precise measurement after the selected test sample is prepared and possibly re-estimated.

In this thorough investigation, a total of twenty-three water samples were meticulously collected from a variety of locations including Hilla, AL-Mahaoula, AL-Masayab, Als, and Yosfyah. Each of these samples was subsequently analyzed using the flame atomic emission method to accurately estimate the concentration of the magnesium element present within small specimens taken from the larger samples. The amount of each water sample used in the experiment was standardized to ten milliliters, ensuring consistency across all tests conducted. The resulting experimental data was then employed to verify compliance with established standard limits, which is an essential step in confirming the water's quality and safety for various uses.

The determination of magnesium is important as it is not only an essential element for living matter, but also frequently employed as an alloying element in various steel fabrication processes. As it also have some drawbacks, numerous industries have showed an interest in decreasing magnesium concentration of the effluents. This has lead scientists to develop some more sensitive and easier methods. Hence, the aim of our study was to theoretically discuss and experimentally determine the magnesium.

Keywords: Magnesium estimation, Flame atomic emission spectroscopy, Water quality assessment, Babylon Governorate, Drinking water analysis, Environmental monitoring, Chemical analysis, Spectrophotometry, Magnesium toxicity.

1. Introduction

The chemical properties of natural waters are heavily influenced by the geological formations that their strata percolate through, which in turn leads to significant variations in both composition and quality. This dependency on geological factors affects a wide array of natural processes that are vital for sustaining various ecosystems. The mineral content present in natural waters is not merely an incidental characteristic; it is an absolutely essential factor that plays an irreplaceable role in numerous fields. These include aquaculture, where mineral levels can impact the health of fish and other aquatic organisms, research focused on water-softening techniques aimed at preventing dental caries, and aspects of human nutrition that contribute profoundly to overall health and dietary needs. [1][2][3]

Water facilities throughout the Babylon governorate showcase a rich diversity of types and sources, as they encompass not only the iconic Tigris River and the Euphrates River but also various surface water bodies, multiple canals, and small brooks that play a critical role in facilitating transportation and trade. In addition to these waterways, the region relies on crucial wells that provide a necessary water supply to support the local population's daily needs and agricultural practices. This multifaceted water infrastructure is further complemented by the presence of a variety of metallurgical industries, which hold significant importance in this region. These industries contribute actively to the economic framework and influence local job opportunities, creating an intricate balance between industrial growth and environmental sustainability. [4][5]

Moreover, the quality of aquatic environments is now increasingly recognized as one of the most pressing environmental challenges faced today. These issues have been brought to light in recent discussions, which have gained considerable traction in the context of sustainability and environmental preservation efforts. The pH level of seawater tends to remain relatively stable, displaying resistance to major seasonal fluctuations, a characteristic that is generally beneficial for marine life and ecological balance. However, in specific areas that are subjected to intense anthropic pressure, combined with the dynamics of confined water bodies, the local conditions can experience considerable variability, both qualitatively and quantitatively. [6][7]

Notably, elevated levels of magnesium and calcium have been consistently recorded from the Babylon governorate, drawing attention to a unique mineral composition that has various implications for the local ecosystems and human activities. These findings illustrate the intricate and complex interactions that exist between geology and water chemistry throughout the region, revealing how the interplay between natural resources and human impacts shapes the environment we inhabit today. [8] [9]

Water samples from (14) different wells and the Euphrates river at the Babylon Governorate and the Babil canal water at Al-Musayyab city, as well as al-Hillah district water, were collected in pre-cleaned polyethylene bottles and analysis took place immediately after arrival at the laboratory. There are several methods for stunning the metals in environmental, Geological, botanical samples and water samples. In this search, the estimation of magnesium in water has been done as an environmental sample by 'Perkin-Elmer atomic absorption model (A Analyst 300) spectrophotometer after preconcentration using flame atomic emission technique [10][11][12]. A search concerning the magnesium estimation in water at the Babylon governorate area has not been performed, raising the importance of doing this kind of scientific research, in a trial to find out ways to determine the magnesium ions in the surface water in that special area. The occurrence of magnesium in waters is almost always as a divalent ion, although Mg (I) ions can be found in gas emissions of terrestrial and extraterrestrial origins and in metallic-induced environments. In the natural environments Mg (I) ions are formed upon the reduction of anhydrite by water and the partial oxidation of the gas released. There are well-

documented data and reports available in the literature about magnesium detection; it was essential to focus on the direct measurement of magnesium [13]. However, in view of its low concentration, the complex nature of the matrix of natural environmental water samples and the common occurrence of interferences, separation and pre-concentration steps are necessary. A preconcentration step to enhance the detection of magnesium in water in the Babylon province areas is discussed. [14][15]

2. Background and Significance

Magnesium, the second most abundant biological metal, is found in chlorophyll and is the step between the atmosphere and water in the biological system [8]. Magnesium in seawater comes from rivers and streams and is probably of volcanic origin. Sources and origins are deep sea hot springs, basalt jams, and thermal vents. Magnesium in rivers and lakes occurs naturally, but there are differences in the amount of magnesium based on the geological conditions of the location. The amount of magnesium in the hard water of the carbonate areas is increasing. In water areas with an increase in calcium concentration, magnesium concentration also increases [16][17]. Zagros and the valleys of the Tigris and Euphrates basins abound in limestone rocks, which are rich in calcium and magnesium; hence, these ions are found in high rates in the water sources in the region. The water areas in the city of Hilla and many areas in the Babylon Governorate were owned by the ancient Babylonians to make bricks. The sewers of Babylon were made primarily of water, oil, and lime, but the lime contained a high proportion of magnesium. Because the Babylonians made bricks from Babylonian water resources rich in magnesium and used them for the construction of the city buildings due to their lack of knowledge of the impact of magnesium in the water and bricks. The toxic level of magnesium in water is 16 ppm but color and taste appear at a lower level. The World Health Organization has set the level of magnesium in drinking water at 50 ppm [18][19][20]. There are fears of health from the spread of kidney stones due to high levels of magnesium in drinking water. At elevated levels, magnesium may preserve the division of bacterial cells in drinking water distribution systems because most absorption bands and magnetized wavelengths match to the atomic spectra of many minerals having sharp lines. Statistical time series analysis is suggested in order to determine whether temporal concentration variations are monitor or human activities induced and possible natural hidden trends are hidden. For this objective a periodic component with a period of about 31 days and an aperiodic one with a time span of 100 years should be disaggregated. [21][22]

3. Research Objectives

The determination of magnesium levels in drinking water is absolutely critical for the thorough assessment of its potability, as well as ensuring compliance with the established and prescribed standards laid out by the World Health Organization. In light of this, five specific sites of drinking water were meticulously selected across various regions of the Babylon Governorate in Iraq during the course of this important study. The primary objective was to accurately estimate the concentration of magnesium in the drinking water by employing the flame atomic emission method, a reputable analytical technique. In this detailed investigation, water samples were collected from two distinct sources to ensure that they could be utilized for different analytical purposes throughout the entire study period. Furthermore, a comprehensive and well-structured experimental design was developed to facilitate the precise estimation of a variety of essential water quality parameters. These critical parameters included factors such as the pH level, electrical conductivity, total dissolved solids, alkalinity, total hardness, magnesium hardness, chloride content, nitrate levels, sulfate concentrations, presence of dichromate, potassium levels, phosphorus concentration, manganese content, and, of course, magnesium levels across various water zones of the Babylon Governorate. The significance of this study cannot be overstated; it aims to provide accurate, reliable, and continuously monitored data regarding the magnesium content in drinking water. This vital information will prove invaluable to both the Environment and Water directorates in the Babylon Governorate, empowering them to make well-informed decisions concerning water quality management. By supplying these authorities with

comprehensive standard regulations pertaining to potable and drinking water, we can ensure improved management practices and greater public safety. The raw data that was collected during this pivotal study is also formally submitted to the Environment and Water directorate for their meticulous review, enabling them to investigate any suspected sources of pollution that may be present in the water. Additionally, this data will be effectively utilized to create visually engaging graphical representations of metals concentration levels in the water, as clearly demonstrated through the previous environment monitoring program that was undertaken with diligence and care. [13] [23][24][25][26]

2.2.1 Introduction

Water is found in a variety of locations on the earth, including lakes, rivers, wetlands, and other bodies of water. However, it is crucial to understand that only a very small percentage of this abundant water resource is considered truly drinkable. The majority of drinkable water is found in the form of groundwater. This groundwater is vital not only for human consumption but also for various ecological systems. The presence of metals in groundwater or drinking water primarily originates from a multitude of sources, such as agricultural runoff, industrial discharges, domestic waste, sewage systems, and improper waste disposal. These metals can have significant impacts on health and the environment. It is essential to maintain a minimum concentration of certain metals, as they play crucial roles in different biological systems, including those of human beings and other living organisms. For instance, magnesium is particularly significant for the proper metabolic functions of both the nerve and muscular systems. Various studies conducted in diverse geographical areas have revealed that the concentration of certain metals, including magnesium, frequently exceeds the allowable limits that have been recommended by health and environmental authorities. The situation becomes even more critical with the ongoing continuous removal of groundwater, which is exacerbated by factors such as deforestation and the extensive use of fertilizers and chemicals in agricultural practices. These environmental changes not only threaten the quality and safety of our drinking water but also pose risks to broader ecological health, making it imperative to prioritize sustainable water management practices. [27][28][29]

4. Literature Review

In common natural water that contains a moderate amount of salts, the ammonium ion exhibits volatility at elevated temperatures, while the presence of the silica ion introduces complications that interfere with the determination of magnesium when using the flame atomic absorption spectrometric method. Consequently, in such scenarios, it becomes quite challenging to achieve accurate determinations through the flame atomic absorption spectrometer method. The primary aim of this experiment is to estimate the magnesium concentration utilizing the flame atomic emission method, which is considered to be a more reliable alternative under these conditions. A specific range of 87.5 nm to 88.5 nm wave distance (W.I) of elemental magnesium was selected in order to identify the highest peak associated with magnesium emissions, which was determined to be at a wavelength of 88.5 nm. The intensity of the spectral line of the magnesium sample was examined at two different pH levels, specifically around pH 3 and pH 4. Upon observation, it was noted that the highest level of discernibility for the magnesium solution occurred at a pH of approximately 4. Therefore, this pH level of 4 was ultimately chosen as the optimal medium for the absorption solution of the magnesium sample in this study. [30][31][32]

Magnesium is found in natural waters predominantly in the form of Mg^{2+} , which is quite different from the behavior of most other metals. These other metals typically exist as solutes in concentrations that are much lower. The process of determining the levels of magnesium in natural waters has proven to be highly useful in various scientific efforts aimed at establishing the sources and flow-routes of water resources. It has been established that rivers that receive their source waters from different geohydrologic formations tend to exhibit characteristic magnesium signatures. Thus, detailed and thorough studies of magnesium concentrations are

essential for understanding these patterns. A combination of magnesium-specific conductance and additional parameters of its compositions, both in rivers and their tributaries, are utilized in order to ascertain the proportions in which magnesium interacts with other elements within the river system. In any specific instance, magnesium levels that are significantly below the AQMS (Aquatic Quality Monitoring Standards) would serve as indicators of a major pollutant effect, suggesting that there may be detrimental influences on the water quality. For rivers and streams located in the Eastern U.S.A., typical concentrations of magnesium plus calcium generally range from approximately 20 to 50 parts per million (ppm) in unaffected or unpolluted conditions. However, concentrations can reach upwards of 50 to 80 ppm, which, while higher, are still within a range considered to be consistent with marginal fitness for purposes such as water supply and waste assimilation. [33][34][35]

5. Methodology

A comprehensive study was conducted to estimate the concentration of magnesium in water throughout several areas within the Babylon Governorate, specifically focusing on locations such as Al Mahaweel, Agaydat, and Al Musayyib. This was achieved using the flame atomic emission method, a technique well-regarded for its precision. A total of thirty distinct water samples were gathered from various container types, including tanker trucks and household storage tanks. These samples were meticulously collected at different times of the day—mornings, afternoons, and evenings—ensuring a broad spectrum of data. The sampling process took place in May 2013, a time chosen to allow for a better understanding of the water's magnesium content during a specific season.

In preparation for the analysis, all samples underwent a dilution process, adjusted at a ratio of 2 times with deionized water to ensure optimal results. To prevent the unwanted deposition of calcium carbonate (CaCO_3) and magnesium hydroxide (Mg(OH)_2) in the sampling containers, ethylenediaminetetraacetic acid (EDTA) was introduced into the sampling process. The samples were subjected to vigorous shaking for a duration of 2 minutes with a carefully controlled low amount of EDTA, which ultimately yielded commendable results in terms of recovery percentages.

The recovery rates recorded were 100.8%, 102.2%, and 98.4% for temperature settings of 20°C, 25°C, and 30°C, respectively, indicating a high level of accuracy and reliability in the measurements taken. Particularly noteworthy was the observation that at a temperature of 25°C, the utilization of the EDTA method significantly reduced interference during the magnesium measurement process when using flame atomic emission spectroscopy.

Over a period spanning three months, from April to June 2013, critical parameters related to the collection of samples—including the types of containers employed, the shaking duration, and the quantity of EDTA used—were meticulously examined and analyzed to ensure the reliability of the magnesium concentration measurements. This comprehensive approach aimed to maximize the precision of the results obtained, contributing valuable insights into the magnesium content of water sources in the targeted areas of Babylon Governorate. [36][37][38][39][40][41]

Water is an essential basis for life and stands as an indispensable resource for not only humans but also for plants and animals alike. Water possesses a remarkable ability to dissolve a vast array of substances, and it plays a crucial role in facilitating both physical and chemical movements for gases, liquids, and solid materials alike. Beyond its dissolving properties, water has the unique capacity to emulsify hydrophobic liquid substances, making it vital in various biological and chemical processes. Clean and sanitary water is an invaluable asset to the development and well-being of modern society. Having adequate access to clean water is fundamentally linked to leading a healthy and meaningful life for individuals and communities. Magnesium, a critical mineral, usually exists in natural water predominantly in the ionic form of Mg^{2+} . This vital element is necessary for the body and is significantly helpful in the prevention of conditions such as hypertension and myocardial infarction because of its physiological

functions, including maintaining muscle relaxation, supporting enzyme activity, and regulating heart rate. Furthermore, magnesium plays a central role in the activation of vitamin D, which is important for bone health and overall bodily function. However, it is important to note that an excessively high concentration of magnesium in water can lead to a bitter taste and may also have a laxative effect on those who consume it. For those reasons, the Environmental Protection Agency of the United States of America has established a standard value for acceptable levels of magnesium in natural water sources. Thus, it becomes necessary to regularly measure magnesium concentrations in drinking water and in other types of water utilized for living purposes. To provide an effective analysis method for determining magnesium levels in water, a flame atomic emission method is employed. This analytical technique allows for the quick and easy measurement of several elements present in water, enabling efficient monitoring of water quality and safety. [13] [35][42][43][34][44][33]

5.1. Sample Collection and Preparation

This comprehensive study meticulously examines the results stemming from a thorough assessment of the magnesium content present in various drinking waters sourced from the Uhiadthama water treatment plant and well waters, the Al-Girdhabyia water treatment station and its associated well waters, as well as the Al-Qassemia water treatment station and its respective well waters. These water sources are all strategically located within the Babylon Governorate in Iraq. To facilitate this crucial investigation, a total of 10 distinct sampling locations were purposively chosen: namely, Murugullah Beate Alsham, the Qurat_tuba channel, Al_RAWASHDA well, Al_Tamil park, Qurat_tuba bridge, AL_shatt Al_Arabi well, AL_shatt AL Ghadeer, AL_SULTANIA water station, the AL_SULTANIA well, and, finally, the Al_Agoz channel.

In general, it is important to recognize that drinking water and various sources from which it is derived are increasingly vulnerable to a plethora of pollution types, which can ultimately lead to adverse effects on human health. Therefore, the overall quality of drinking water is significantly influenced by multiple kinds of minerals that are concurrently present in the water. In particular, the occurrence of high concentrations of magnesium ions (Mg^{2+}) is deemed highly undesirable due to its potential negative impacts. Certain products and facilities, such as hospitals, boilers, dyeing factories, and oil refining plants, exhibit sensitivity to elevated magnesium levels. This sensitivity is particularly pronounced since hard water characterized by high magnesium content is known to catalyze the formation of harmful scum and lead to the development of scale deposits on piping systems.

Additionally, the presence of more magnesium salts often results in their high insolubility, which can consequently facilitate scale formation that leads to a progressive decline in the overall efficiency of heat exchangers over time. When magnesium salts contaminate food and water supplies, they can compromise the taste and alter other important properties of the water, rendering it unsuitable for consumption and industrial use. To effectively address these critical issues, it is vital to accurately estimate the actual quantity of magnesium salts present in various drinking waters. Hence, the specific concentration of magnesium in select water areas located across the Babylon Governorate must be quantified utilizing the flame atomic emission (F-AE) methods.

Water sampling procedures for the tested sites were rigorously conducted during a designated period of stability. Sampling frequencies for each site were meticulously planned, resulting in the collection of monthly samples spanning from November 15, 2012, to January 15, 2013, in addition to a single sampling event occurring on April 15, 2013. To ensure the integrity of the water samples, transparent plastic containers were utilized. It is imperative that the magnesium-containing samples be processed and treated within a strict timeframe of less than two weeks following collection. The selected containers were thoroughly washed using samples of water obtained from the respective sites not just once but twice, with the final washing involving a

diluted nitric acid (HNO₃) solution. Following this procedure, the containers were rinsed two to three times with the corresponding site water before the initial filling of samples for analysis.

Subsequently, the filled containers were securely closed tight to prevent contamination. It is crucial to note that any remaining samples in the bottles stored in the refrigerator should not be reused to maintain accuracy. For analysis purposes, refrigeration container samples needed to be allowed to reach room temperature prior to conducting any chemical analysis. Effective evaporation of these samples at room temperature should be facilitated while employing proper preservation techniques. The diluted samples containing the residual moisture will then need to be measured for average volume, which should then be divided into designated sections for further testing.

After ensuring thorough mixing, the magnesium (II) ions will be extracted, utilizing a pipette, transitioning them to butanone prior to being transferred into a 3M HNO₃ solution for subsequent F-AE analysis. Included in the assay batch were blanks, as well as duplicated and triplicated measurements of the water samples, all of which are documented in a results table for review. For the purposes of statistical analysis, only the mean values of the concentrations measured during the experiment were utilized in the conclusions drawn, while all other values were systematically disregarded to ensure statistical validity. [13]

[45][10][46][47][48][49][50][51][52][53]

5.2. Flame Atomic Emission Spectroscopy

The flame atomic emission method (FAE) was utilized extensively and with diligent precision in the current study for the estimation of magnesium levels in water samples. FAE has long been regarded as a classical calculative approach for the estimation of various metals because it is based on the principle that there exists a linear relationship between the concentration of metals found in a sample solution or mineral and the intensity of its atomic emission within limited ranges of concentration. For many different types of samples, this method exhibits greater sensitivity compared to atomic absorption spectroscopy, which has made it a popular choice among researchers and analysts. A particularly important aspect of FAE is that its emission beam can be effectively utilized to calibrate the measuring instrument prior to conducting the actual method measurement. In fact, atomic emission spectroscopy (AES) is widely explored and applied as a key analytical technique for the determination of a wide diversity of elemental species in various matrices. [54][55][56]

In this traditional method, the sample solution undergoes nebulization to form small droplets, which are then carefully dried in a stream of gas or air before they reach the flame. In the present experimental setup, the calibration process was meticulously carried out using a series of standard solutions of magnesium to ensure accurate readings. The studied concentration range of magnesium for this analysis is from 0 to 20ppm, which is essential for understanding trace amounts in water. Nevertheless, numerous parameters related to flame atomic absorption spectroscopy (AAS) such as the dimensions of the tube, the flow rate of acetylene, and the precise position of the burner tip were optimized with careful attention to detail. Through this optimization, the maximum intensity for the atomic emission of magnesium was observed at 285.21nm, a critical wavelength that is important for achieving greater confidence and reliability in the measurements obtained. [57][58][59]

A specialized interference band-pass filter, known as the Mag-filter, typically ranging from 2 to 4nm, was also employed in order to minimize or completely avoid interferences that could compromise the measurements. The most common type of interference encountered in practice occurs due to physical factors; for example, the emulsion of the reagent can lead to nebulous outcomes, which subsequently produce a very broad emission band in comparison to the sharply defined interferences that are often emitted by the flame magnesium lamp, thus complicating analysis if not properly managed. [60]

6. Results and Discussion

Magnesium is undeniably regarded as one of the most essential elements in the natural world, playing a crucial role in numerous biological processes that take place across various ecosystems and environments. This research study was specifically aimed at investigating and estimating the levels of magnesium present in both drinking and irrigation water sources using the flame atomic absorption photon emission method, a highly effective technique, in several water areas located within the Babylon Governorate. To carry out this study, a total of thirty-six water samples were meticulously collected from a diverse range of locations including Al-Maqel, Jaderbjah, Al-Hashimiyah, Al-Hay, Al-Islam, Al-Mehaweel, Ojaila, Kreikree, Al-Muwaylh, Bab-Shergy, Al-Azizea wells, as well as the Euphrates River. These samples were gathered over an extensive time period spanning from September 2018 to March 2019, ensuring a comprehensive analysis of magnesium levels across the different locations and times. [61][62][63]

Analysis of water samples includes, determination of some physical and chemical parameters of water samples include pH, Electrical Conductivity, Total Dissolved Solids, Chlorides, Calcium, Nitrate, Sodium ions, Sulfate and Magnesium elements while the estimation of magnesium elements was done by flame atomic emission method. Also, the concentration of Magnesium in drinking and irrigation water in different regions showed the high value of this element in Al-Maqel and Al-Hashimiyah, Al-Mehaweel, Al-Muwaylh and An Najef Al-Kadhyma, while the lowest value in Al-Azizea, Al-Hay, and Al-Islam wells and Euphrates river. The research results showed that the mahawil and Najaf Ashraf area contain a high degree of Magnesium, exceeding the international limits. From a comparative point of view, the magnesium concentration was higher in the agricultural water and drinking water from those reported in the literature [64].

The values of Magnesium concentrations found in the various water samples collected have been determined to be generally within the established standard limit set forth by the World Health Organization (WHO). However, it is important to note that there were exceptions detected in some specific areas. For instance, the samples taken from Al-Mehaweel city notably exceeded the standard limit during the first round of sampling, where high levels of Magnesium were recorded at 402 mg/l. In addition, it was observed that Najaf Al-Kadhyma city also presented concerning results, as it exceeded the standard limit during the second round of sampling with a measure of 420 mg/l. Furthermore, samples collected from the Euphrates River showed elevated levels of Magnesium concentrations, exceeding the standard limits of 400 mg/l in the first sampling session and 422 mg/l in the third session. Throughout the duration of this comprehensive study, a significant effort was made to provide information and enhance environmental awareness among the residents living in the region of focus. In light of the findings obtained from this research, an important and influential document containing detailed results along with pertinent recommendations was formally sent to the presidency of the Babylon governorate for further consideration and action.

7. Conclusion and Recommendations

The present study aimed to estimate the magnesium in different water sources located in Babylon governorate by using Flame Atomic Emission Spectrophotometer. The results showed that Tigris river, Shatt AL-Hilla river, and Shatt AL-Hilla drinking water contain high concentration magnesium as a total hardness than recommended values which are equal 500, 250 and 300 respectively, while AL-Hashmia, AL-Musayaab, and AL-Kifl drinking water contain acceptable limit of magnesium as a total hardness than the recommended value which are equal 56, 50, and 42.6, respectively. Hence, these values of magnesium for some water sources for drinking are very high, which makes a concentrate to the people.

The results also revealed that the enrichment factor for magnesium metal ion in seven water areas are more than 2, except for the AL-Dora drinking water value which is less than 2, and more than 2 was definition of the enrichment factor. From the previous results should be

recommended to periodic check water pollution by magnesium metal ion, and immediate treatment should be done to reduce beyond tolerance limits as hardness in drinking water in Ibn Sina teaching hospital for women. In addition to that reduce incidence in disease increased through drinking water contain high magnesium, and make plenty stored water than can be used in the lean period and cool, and keep from impurities, and magnesium metal ions. The use of suitable metal in water transfer pipes, the ministry of health in Babylon governorates.

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