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Biochemical Study of Zamzam Water According to Cities Water

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ABSTRACT Three samples of Zumzum water were collected from Mecca for 3 years (20011, 20012 & 20013 respectively). Chemical, physical & biological properties of these 3 samples were studied by reliable methods according to the city water (tap water) after 1, 2 and 3 years of storage. The physical study shows that no change in tastes, odor, color and pH of these 3 samples, also chemical study shows that there is slightly increase in calcium and magnesium ions more than the tap water which leads to understand why this water refreshes tired Hajjes. But more significantly, the water has no biological or vegetative growth in all samples, in spite of stored for 1, 2 and 3 years that make this water reliable for drinking our research aims to examine the composition of tap water and Zamzam water after a storage period of three years. Additionally, we seek to assess their quality in accordance with international drinking water standards.

INDEX TERMS zamzam water, tap water, chemical, physical and biological analysis

I. INTRODUCTION

Zamzam water is highly favored as a potable source, regarded as superior to other drinking water options in Arabic and Islamic nations. The well from which Zamzam water originates is sterile, free from bacteria and fungi, located to the east of the Kaaba, the focal point of Muslim prayers, in the city of Mecca, Saudi Arabia. Millions of Saudi citizens and international residents residing in Saudi Arabia commonly use Zamzam water for drinking. Millions of pilgrims visiting Saudi Arabia annually consume Zamzam water consistently for 1-3 months, and they often bring it back to their home countries as gifts for close relatives and friends. Examining the impact of Zamzam water's components on human health is a crucial health-related subject. [1] Zamzam water and the Zamzam well remain uncontaminated by biological growth, such as bacteria or fungi. Notably, Zamzam water has been confirmed to be devoid of contaminants and undergoes no chemical treatment [2]. Additionally, it was observed that Zamzam water exhibits a mild antifungal effect comparable to certain antifungal agents [3]. Zamzam water is abundant in minerals, and as a result, its health-related characteristics, such as taste, odor, and smell, remain consistent and do not alter over time. The water contains significant amounts of four essential metal ions: sodium, potassium, magnesium, and calcium. Additionally, seven trace metal ions are also present in

Zamzam water. These encompass vanadium, manganese, iron, cobalt, copper, zinc, and molybdenum. It is widely recognized that trace metals are essential for normal biological functions in humans [4]. The distinctive mineral composition of Zamzam water has been observed to maintain consistent mineral and electrolyte levels in individuals whose daily maximum consumption is Zamzam water. Additionally, kidney function tests for those reliant on Zamzam water have shown results within the normal range [5]. Zamzam water has been documented to possess diverse therapeutic and pharmacological qualities, including antioxidant, antitumor, anxiolytic, and antidepressant properties. Notably, the concurrent administration of methadone and Zamzam water effectively mitigated the spontaneous withdrawal symptoms, such as body weight loss, in rats dependent on morphine [6]. Numerous Muslims hold the belief that the water from the Zamzam well carries divine blessings, capable of fulfilling both hunger and thirst, and possessing healing properties. Pilgrims make deliberate efforts to consume this water during their pilgrimage, while those residing in close proximity may partake in it more regularly [7]. According to Islamic belief, the Zamzam well was revealed to Hagar, the mother of Ibrahim (Abraham in English), and her son Ismail. In her earnest search for water for her infant son, according to Muslim tradition, Hagar is said to have traversed seven times between the scorching

hills of Safa and Marwah. In response, God sent the angel Gabriel, who, by scraping the ground, caused a spring to emerge. Upon discovering the spring, Hagar marked the pool of water with sand and stones. Alternatively, alternative versions of the narrative suggest that Ismail, her son, scraped the ground with his heel, leading to the appearance of Zamzam. The grandfather of the Islamic Prophet Mohammad, Abdul Muttalib, is credited with rediscovering the well, which had been neglected and filled with sand. He assumed the role of its guardian, responsible for its maintenance and for serving the Arabs who undertook pilgrimages to Mecca [8]. Today, the water is accessible to the public through coolers strategically placed in the Masjid Al Haram in Mecca and the Masjid Al Nabawi in Medina. Efforts have been made to scientifically validate Muslim beliefs concerning the unique properties of Zamzam water, which is purported to contain elevated levels of certain minerals, including calcium, magnesium, and fluorid [9]. Centuries ago, the story began when Ibrahim, following Allah Almighty's commands, brought Hagar and Ismail to the city of Paran (Mecca). In that barren place where life and water were nonexistent, Allah Almighty instructed Ibrahim to construct the House of GOD (Kaaba) and to leave Hagar and their son Ismail there. Subsequently, when Hagar and Ismail faced severe thirst after exhausting the water they had brought on their journey, Hagar prayed to Allah Almighty for water. Desperately searching for water in the hills of Safa and Marwah to quench her newborn son Ismail's thirst, Hagar ran from one location to another. During this endeavor, her child's feet brushed against the sand, and miraculously, a pool of water emerged, shaping itself into a well known as Zamzam water by the grace of God [10 - 12]. It was challenging for us to accept that a seemingly modest water source, resembling a small pond measuring approximately 18 by 14 feet, could be the well responsible for supplying millions of gallons of water annually for the Hajj pilgrimage ever since its establishment during the time of Hazrat Ibrahim many centuries ago [13,14]. The well has consistently remained full and never experienced drying, consistently meeting the demand for water while retaining its original salt composition and taste [15]. The universal allure of Zamzam water has endured, and notably, this water has never undergone chemical treatment or chlorination, unlike city-supplied water [16].

II. MATERIAL AND METHODS

Three samples of Zumzum water were brought from Mecca, in 2011, 2012 and 2013 respectively (one liter from each sample) which were collected in an ordinary containers and stored for three years,

two years and one year ago, to analysed for any biological or vegetation growth, and also to study physical and chemical property of this water. Also one liter of city water stored in the same way of zamzam water samples

III. RESULTS

Our findings confirm that Zamzam water is free from pathogens, as evidenced by the absence of bacterial growth on Crystine Lactose-Electrolyte Deficient Agar (CLED). The water's quality remained consistent over 1, 2, and 3 years, with excellent agreement observed among the results of the three water samples, as well as consistency in results over the three-year period for the same tap water samples analyzed. The water exhibits an alkaline nature, with an average pH of 7.8. Additionally, there is a slight increase in the averages of calcium (Ca) and magnesium (Mg). The generated data should be disseminated to the public, and attention should be given to addressing the correlation between pollution and human health. Three samples of Zamzam water, along with three bottles of tap water, underwent analysis following standard methods outlined by the quality control center at Acai company [17]. The chemical components, comprising pH, total dissolved solids (TDS), sodium (Na), magnesium (Mg), calcium (Ca), chloride (Cl), sulfate (SO₄), calcium carbonate (CaCO₃), and total suspended solids (TSS), were examined. The results obtained were subsequently compared to the drinking water quality standards established by the World Health Organization (WHO) and the Environmental Protection Agency (EPA). Every parameter examined was determined to fall below the maximum allowable limits (MAL) set by the World Health Organization (WHO) and the Environmental Protection Agency (EPA) in comparison to the gathered tap water samples. The research concluded that Zamzam water exhibits a chemical composition that meets acceptable standards.

A. PHYSICAL TESTS

The physical test of Zamzam water appears as the following.

- Taste = Tasteless
- Odor = Odorless
- Cooler = Coolerless

B. CHEMICAL TESTS

The tables (I, II, and III) present the chemical components of Zamzam water in three samples, indicating that the disparity

between Zamzam and alternative water sources (city water) lies in the levels of calcium and magnesium ions. Also in the composition of solid, and suspended dissolved materials.

TABLE I

CHEMICAL ANALYSIS OF ZAMZAM WATER (YEAR = 2011 ACCORDING TO TAPE WATER).

Chemical categories	Zamzam water	Tape water
Total dissolved solid TDS	500 mg/L	N. MT 1500mg/L
Total suspended solid TSS	50 mg/L	For information
Total hardness as CaCO ₃	550 mg/L	N. MT 500mg/L
Calcium as Ca	202 mg/L	N. MT 200mg/L
Magnesium as Mg	122 mg/L	N. MT 150mg/L
Chloride as Cl	224.93 mg/L	N. MT 600mg/L
Sulphate as SO ₄	96.7 mg/L	N. MT 400mg/L
TDS + TSS	550 mg/L	

TABLE II

CHEMICAL ANALYSIS OF ZAMZAM WATER (YEAR= 2012 ACCORDING TO TAPE WATER).

CHEMICAL CATEGORIES	Zamzam water	Tape water
Total dissolved solid TDS	601 mg/L	N. MT 1500mg/L
Total suspended solid TSS	82 mg/L	For information
Total hardness as CaCO ₃	516 mg/L	N. MT 500mg/L
Calcium as Ca	205 mg/L	N. MT 200mg/L
Magnesium as Mg	150 mg/L	N. MT 150mg/L
Chloride as Cl	199.9 mg/L	N. MT 600mg/L
Sulphate as SO ₄	309.52 mg/L	N. MT 400mg/L
TDS + TSS	683 mg/L	

TABLE III

CHEMICAL WATER ANALYSIS OF ZAMZAM WATER (YEAR = 2013 ACCORDING TO TAPE WATER).

CHEMICAL CATEGORIES	Zumzum water	Tape water
Total dissolved solid TDS	579 mg/L	N. MT 1500mg/L
Total suspended solid TSS	17 mg/L	For information
Total hardness as CaCO ₃	511 mg/L	N. MT 500mg/L
Calcium as Ca	203 mg/L	N. MT 200mg/L
Magnesium as Mg	153 mg/L	N. MT 150mg/L
Chloride as Cl	187.44 mg/L	N. MT 600mg/L
Sulphate as SO ₄	329.2 mg/L	N. MT 400mg/L
TDS + TSS	596 mg/L	

C. BIOLOGICAL STUDY

Zamzam water is devoid of pathogens, as evidenced by the absence of any growth or colonies on CLED agar after incubating three distinct Zamzam water samples for 48 hours.

IV. DISCUSSION

Based on the findings presented in this study, it is evident that the distinction between Zamzam water and other sources, such as city water, lies in the quantity of calcium and magnesium ions. Zamzam water exhibited slightly higher levels of these ions. This explains why the water is refreshing for fatigued hajjis. Importantly, all samples showed no biological or vegetative growth, establishing the water as reliable for drinking. Additionally, assessments from European laboratories affirmed that the water is suitable for consumption [16]. It is truly a blessing that this study delved into revealing the chemical composition of the water. The more one explores, the more wonders emerge, fostering an implicit belief in the miracles of this water bestowed by God as a gift to the faithful who travel from afar to the desert land for pilgrimage. Contrastingly, most wells commonly experience biological growth and vegetation, leading to unpalatable water due to the presence of algae, causing taste and odor issues [2]. The therapeutic attributes of Zamzam water are likely linked to its alkaline nature. Several studies, including the work by Kellas et al. [18], have delved into the mechanisms by which alkaline water contributes to the healing process. Kellas et al. noted that alkaline drinking water plays a crucial role in eliminating mercury and other toxins from the body. The acidity of the body correlates with its tendency to retain heavy metals. Heavy metals contribute to elevated oxidative stress, leading to acidification of the body [19]. Thorough scrutiny is applied to Zamzam water to alleviate

apprehensions regarding its safety, offering reassurance to the countless Muslims who partake in it as a representation of honor and blessings. The results of this investigation suggest that the chemical composition of Zamzam water adheres to the standards outlined by the World Health Organization (WHO) and the Environmental Protection Agency (EPA) for ensuring the safety of drinking water. [20 - 22]. It has been documented that this water includes fluorides with potent germicidal properties. Importantly, unlike city-supplied water, this water has never undergone chemical treatment or chlorination [3].

V. CONCLUSION

The health-related inquiries raised by the BBC regarding the safety of Zamzam water provided an opportunity for valuable scientific investigations that substantiated the safety and positive health effects of Zamzam water. It is essential to disclose any potential conflicts of interest. The potential healing properties of Zamzam water may be linked to its alkalinity. Nonetheless, it is crucial to develop and implement a scientific strategy that facilitates ongoing research and studies on toxicology. If necessary, treatment technologies could be applied.

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