مجلة علمية محكمة - ربع سنوية
Scientific Refereed Journal - Quarterly
South-South Dialogue

# Effect of Drinking Water on Hyperuricemia Patients

# تأثير شرب المياه على مرضى فرط حمض يوريك الدم

**Amany Ashraf Abdel- All Hassan**

B S C. in Specific Education, Department of Home Economics, Assiut University

**Prof. Dr. Nareman Saed Eshak**

Professor of Nutrition and Food Science of the Department of Home Economics and Vice Dean for Graduate Studies, and Researches, Faculty of Specific Education, Assiut University

**Dr. Esraa Ahmed Talat Galal**

Lecturer of the Department of Rheumatology , Rehabilitation and Physical Medicine ,

Faculty of Medicine, Assiut University

المجلد السابع – العدد ٢٣ – أكتوبر ٢٠٢٤

الترقيم الدولي

P-ISSN: 2535-2229 O - ISSN: 3009-6014

موقع المجلة عبر بنك المعرفة المصري https://hgg.journals.ekb.eg/

العنوان: كلية التربية النوعية – جامعة أسيوط – جمهورية مصر العربية

Add: Faculty of Specific Education-Nile street- Assiut
العنوان : كلية التربية النوعية –شارع النيل – أسيوط
Print ISSN: 2535-2229
On Line ISSN: 3009-6014
https://hgg.journals.ekb.eg
Office / Fax 088/2143535 : فاكس / مباشر
Tel 088/2143536 : تليفون
Mob 01027753777 : موبايل

# Effect of Drinking Water on Hyperuricemia Patients


## Abstract

This study aimed to evaluate the role of drinking a sufficient amount of water throughout the day to reduce the symptoms of hyperuricemia and reduce uric acid levels in the blood in patients with hyperuricemia. 30 individuals ( 7 males and 23 females) participated in this study ages > 18 years old ,they were divided into 3 groups equaly. G1 (negative control group), G2 (positive control group were given medical treatment only at a dose 0.5 mg of colchicine twice daily), and G3 (hyperuricemia patients that were given 2.5 liters of water daily plus medical treatment at a dose 0.5 mg of colchicine twice daily) for 4 months. Anthropometric measurments including body weight, height, and body mass index (BMI) were measured. Also, blood samples were collected for determined uric acid, , hemoglobin AIC, urea nitrogen, creatinine and glucose. The results showed that G2 and G3 had a very highly significant ($P < 0.01$) effect in reducing uric acid levels in the blood compared to G1 . However, G3 showed better improvement, as blood uric acid levels decreased and G1 increased. Therefore, this study recommended drinking 2000-3000 ml or 2.5 liters of water daily, provided that the periods of water intake are spaced and consumed continuously throughout the day, because it has a major role in reducing the symptoms of hyperuricemia and reducing uric acid levels in the blood .



## Key words:

Hyperuricemia, Uric acid, Water drinking, Gout, Kidney stones.

## Introduction

Uric acid is a product of the metabolic degradation of purine nucleotides and is excreted largely by the kidneys and has been associated with the incidence of gout and kidney stones **( Abujbara *et al*., 2022).** Hyperuricemia is defined as an elevated serum uric acid level, usually greater than 6 mg/dL in women and 7 mg/dL in men **(George *et al*., 2023).** Uric acid is a weak acid with a pKa of 5.8. Uric acid occurs primarily as an anionic urate at physiological pH of 7.4. The reference range for serum uric acid in humans is 1.5–6.0 mg/dL for women and 2.5–7.0 mg/dL for men. There is a difference between the sexes in that hyperuricemia is more common in men **( Jin،.et al 2012).** Uric acid has low solubility in water, so the average concentration of uric acid in human serum is at the dissolution limit (6.8 mg/dL). When this level is exceeded, it is crystallized as monosodium urate (MSU).**( Otani *et al*., 2023)**

Causes of hyperuricemia can be classified into two functional types: increased production of uric acid and decreased excretion of uric acid**.** Causes of increased production include high levels of purine in the diet and increased purine metabolism. Causes of decreased excretion include kidney disease, gene SLC2A9, certain drugs, and competition for excretion between uric acid and other molecules. Mixed causes (increasing production and decreasing excretion of uric acid) include high levels of alcohol and/or fructose in the diet, Pseudohypoxia, ketoacidosis, insulin resistance, hypertension soft drinks, obesity, lacticacidosis and starvation. **( Abujbara *et al*., 2022 and Yamamoto et al.,2008)**

Many factors contribute to hyperuricemia such as: genetics, insulin resistance, hypertension, hypothyroidism, chronic kidney disease, obesity, diet, iron overload, use of diuretics (thiazides, loop diuretics), and excessive consumption of alcoholic beverages.**( Al-Ghamdi *et al*., 2023)**

Epidemiological studies have shown that low urine volume ( as a result of hot climate, intense physical activity, or low water intake) is an important risk factor for kidney stone recurrence. **(Masot *et al*., 2020)**, as drinking a sufficient amount of water can help control blood uric acid levels , reduce the risk of health problems associated with high uric acid levels, such as gout and kidney stones by lowering blood uric acid levels , support healthy kidney function and promote the smooth excretion of uric acid in the body **(Lieske et al., 2019).**Therefore, this study aims to find out the effect of consuming a sufficient amount of water on patients with hyperuricemia.

## 1-Subjects Samples

Thirty patients with hyperuricemia aged (>18 years old) were enrolled in the study. Ten persons without hyperuricemia were chosen as a negative control group. The study was conducted in the outpatient clinics of the Department of Rheumatology, Rehabilitation and Physical Medicine at Assiut University Hospital. Personal and social data were obtained for all groups (gender, age, educational level, occupation, family size, marital status).

### 1-1-Ethical research

All subjects included in this study provided written informed consent, and the protocol of this study was approved by the ethics committee of the Faculty of Medicine , Assiut University .

### 1-2-Inclusion criteria

Patients who suffer from symptoms of hyperuricemia **(**gout**)** and patients who have asymptomatic hyperuricemia (>18 years old).

### 1-3-Exclusion criteria

Patients have normal or lower levels of blood uric acid ; Patients who are under 18 years old ; patients with other autoimmune diseases such as: (lupus, rheumatoid arthritis, Crohn's disease and ulcerative colitis); Diabetics; Chronic kidney disease or kidney failure; cancer patients and Patients have recent surgery.

## 2-Methods

### 2-1-Laboratory tests

Blood samples were collected for determined uric acid, hemoglobin AIC, urea nitrogen, creatinine and glucose.

### 2-2-Experimental design

30 individuals **(**7 males and 23 females**)** participated in this study ages > 18 years old , were divided into three groups ( Each group consists of 10 patients). G1 (was the negative control group), G2 ( was the positive control group were given medical treatment only at a dose 0.5 mg of colchicine twice daily), and G3 (was hyperuricemia patients were given 2.5 liters of water daily plus medical treatment at a dose 0.5 mg of colchicine twice daily) before and after treatment for four months.

## 3-Study tools

Questionnaires were administered by the researcher and supervisors for obtaining information in Arabic. The questionnaire was completed through face-to-face interviews before and after treatment for (4 months).

## 3-1-Socio-Economic and demographic data of participants Form

It was taken the patients' socio-economic and demographic data (age, gender, level of education, family size and social status) before and after treatment periods (4 months). **(Qi *et al.*, 2023(**

## 3-2-Anthropometric measurements of participants Form

It was taken the patients' anthropometric measurements (weight, height, and body mass index (BMI)) before and after treatment periods (4 months).

Weight (WT) was measured by an electronic digital scale with light clothing and no shoes to the nearest 0.1 kg according to **Kuriyan *et al*.,(2014)**

Height (HT) was also measured in a standing position without shoes using a wall-mounted height meter. Feet were put together with heels, buttocks, shoulder, and back of the head touching the wall according to ***Warrier et al*.,(2023)**

Body Mass Index (BMI) of each participant was calculated by (BMI = weight (kg) / height (m2)) according to **Nuttall,(2015)** .The World Health Organization classified adults as obese (BMI >30), overweight (BMI = 25–29.99), and normal (BMI = 18.50-24.99). **(Weir and Jan, 2023)**

## 3-3-Laboratory tests of participants Form

Information was collected about patients' laboratory tests, such as: (blood samples were collected for determined uric acid, hemoglobin AIC, urea nitrogen, creatinine and glucose) before and after the experiment

## 4-Statistical analysis

Categorical variables were described by number and percentage (N, %), while continuous variables were described by mean and standard deviation (Mean, SD). **(Mishra *et al*.,2019).**All data obtained were subjected to statistical analysis of variance and the treatment means were compared to obtain statistically significant differences using "LSD" for the least significant difference at $p<0.05$ and $p<0.01$ by using the computer program for mathematical and statistical operations Microsoft Excel 2010 **(Russell, 2013).**A computer programme was used to perform all the analysis of variance in accordance with the procedure outlined by **Duncan, (2015).**

## Results and Discussion

**Table (1): Socio-Economic and demographic data of participants**

| Items | | All participants (G1,G2 and G3)(n=30) | Participants who do not suffer from hyperuricemia(n=10) | Participants with hyperuricemia(n=20) |
|---|---|---|---|---|
| **Age (yrs)** | Male | 31.00± 7.73 | 22.5 ± 2.5 | 34.40 ± 6.37 |
| | Females | 41.48 ± 14.62 | 29.6± 7.73 | 47.8± 13.45 |
| **Gender** | Male | 7 ( 23.33%) | 2(20%) | 5(25%) |
| | Females | 23 ( 76.67%) | 8(80%) | 15(75%) |
| **Education level** | ≤ High level | 14 ( 46.67%) | 1(10%) | 13(65%) |
| | >High level | 16 ( 53.33%) | 9(90%) | 7(35%) |
| **Occupation** | Working | 13 ( 43.33%) | 6(60%) | 7(35%) |
| | Not Working | 17 ( 56.67%) | 4(40%) | 13(65%) |
| **Family history** | yes | 9 (30%) | 0(0%) | 9(45%) |
| | No | 21 (70%) | 10(100%) | 11(55%) |
| **Social Status** | Single | 8 ( 26.67%) | 6(60%) | 2(10%) |
| | Married | 22 (73.33%) | 4(40%) | 18(90%) |

Socio-Economic and demographic data of participants presented in **Table (1).** Accordance to age, the results in **Table 1** showed that the average age of patients with hyperuricemia of male (34.40 ± 6.37), while the average age of females (47.8± 13.45). It was also found that the percentage of female patients suffering from hyperuricemia was higher (75 %) than the percentage of male patients (25%) due to women being older than men. This result is consistent with **Zitt *et al*., (2020)** they found that women with gout and hyperuricemia developing gout and hyperuricemia at an older age than male patients.

Education level results in **Table 1**, the results indicated that (65%) of the patients did not have a higher educational level, and (35%) of those with a higher education degree. In general, low and middle educational level were associated with an increased risk of developing hyperuricemia. This was confirmed by **Zhang *et al*., (2018)** they showed that low to moderate education level is also a risk factor for hyperuricemia. Some researchers have found that well-educated individuals seem to have a healthier, more balanced diet. This may be because people with low to moderate levels of education have fewer opportunities to accumulate nutritional knowledge, and therefore may pay less attention to their nutritional intake.

In accordance with the results of occupation in **Table 1** showed that (35%) of the sample they suffer from hyperuricemia are working, but (65%) of those are not working, and this is evidence of the extent to which lack of physical activity is linked to increased hyperuricemia. Studies have shown that exercise can effectively reduce serum uric acid (SUA), but the ideal exercise dose, intensity, and exercise method to improve HUA have not been verified in clinical studies. **(Wang *et al*., 2021)**

Regarding to family history in **Table 1**, the results also showed that patients with hyperuricemia had less family history (45%) than those without family history (55%), due to the presence of other factors that contribute to increasing hyperuricemia. This result is consistent with Pradnyawati, (2020) they confirmed that family history is not a risk factor for hyperuricemia.

As for social Status in **Table 1**, the results proved that (10%) of the sample were single, followed by (90%) married patients. This result was contradictory to **Song *et al*., (2018)** who found that the prevalence of hyperuricemia among married or cohabiting patients (6.2%) was lower than that of unmarried participants (7.4%). This is due to the presence of other factors are associated with increased hyperuricemia, such as (age, chronic diseases, and body mass index).

**Table (2): Anthropometric measurements of participants before and after the experiment ( 4 months)**

| **Groups** | **BMI(Weight (kg) / Height (m2)** | | |
|---|---|---|---|
| | **Before** | **After** | **P. value** |
| G1( Control Negative group) | 23.7 ± 2.3 | 22.7 ± 2.0 | P > 0.05 |
| G2(medical treatment only at a dose 0.5 mg of colchicine twice daily ) | 30 ± 3.4 | 27.7 ± 4.4 | P < 0.05 |
| G3(2.5L water plus at a dose 0.5 mg of colchicine twice daily ) | 30.2 ± 2.3 | 22.5 ± 2.3 | P < 0.01 |
| P. value between groups 1&2 between Pre. and Post | ( P < 0.05)<br>(23.7 -22.7) vs (30 -27.7 )<br>(1.0) vs (2.3) | | |
| P. value between groups 1&3 between Pre. and Post | ( P < 0.01)<br>(23.7 -22.7) vs (30.2 -22.5 )<br>(1.0) vs (7.7) | | |
| P. value between groups 2&3 between Pre. and Post | ( P < 0.05)<br>(30 -27.7 ) vs (30.2 -22.5 )<br>(2.3) vs (7.7) | | |

values are expressed as mean ±Standard Deviation SD.

**Table 2** presents the statistical analysis of participants' anthropometric measurements for three different groups before and after the experiment. These results indicate that there is no significant difference in the values measured in G1 compared to G2 and G3. G3 showed the greatest improvement in reducing BMI values ( P < 0.01) compared to G2 and G1 . In G3, the BMI values decreased from 30.2 ± 2.3 to 22.5 ± 2.3. This is in contrast to G2, where the decrease was from 30 ± 3.4 to 27.7 ± 4.4, and G1, where the decrease was from 23.7 ± 2.3 to 22.7 ± 2.0. The significant reduction in BMI values in G3 is attributed to increased hydration, which is known to aid in weight loss, lower BMI, and reduce the risk of various health conditions associated with being overweight, such as obesity, diabetes, cancer, and cardiovascular disease **(Thornton, 2016).**

These findings align with the results of a study by **Miller *et al.* (2011),** who found that approximately 30% of all adults in the United States who attempted to lose weight increased their water intake. Another smaller survey found that 59% of all adults frequently used increased water consumption as a strategy for weight management.

**Table (3): Serum urea nitrogen of participants before and after the experiment ( 4 months)**

| Groups | Blood Urea Nitrogen | | |
|---|---|---|---|
| | **Before** | **After** | **P. value** |
| G1(Control Negative group) | 20±4.1 | 20±4.1 | P > 0.05 |
| G2(medical treatment only at a dose 0.5 mg of colchicine twice daily ) | 69.3±26.3 | 22.2±3.05 | P < 0.01 |
| G3 (2.5L water plus at a dose 0.5 mg of colchicine twice daily) | 73±33.5 | 23.9±9.0 | P < 0.01 |
| P. value between groups 1&2 between Pre. and Post | ( P < 0.01)<br>(20 -20) vs (69.3 - 22.2)<br>(0) vs (47.1) | | |
| P. value between groups 1&3 between Pre. and Post | ( P < 0.01)<br>(20 -20 ) vs (73 -23.9)<br>(0) vs (49.1) | | |
| P. value between groups 2&3 between Pre. and Post | ( P > 0.05)<br>(69.3 - 22.2) vs (73 -23.9)<br>(47.1) vs (49.1) | | |

values are expressed as mean ±Standard Deviation SD.

In accordance to the statistical analysis of Serum urea nitrogen of participants before and after the experiment ( 4 months) in **Table 3**. Our results showed that individuals who consumed a large amount of water and drug treatment in G2 and G3 had significantly lower blood urea nitrogen levels (P < 0.01), while there was no significant difference in G1 (P > 0.05) that did not witness any noticeable change because no treatment was applied to it. Of note, our findings found that G3 showed better improvement, as blood urea nitrogen levels decreased from (73±33.5) to (23.9±9.0) compared to G2 decreased from (69.3±26.3) to (22.2±3.05) and G1 increased from (20±4.1) to (20±4.1).

Our results showed that water intake volume was negatively associated with blood urea nitrogen. In addition, water intake was also strongly negatively associated with BUN (P < 0.01). Water contributes to cell duplication and it also helps formation of urine to clear the body from toxins. Our results are consistent with **Unal *et al*., (2017)** who demonstrated that blood urea levels increased significantly in the group that consumed < 2 liters of water per day compared to the group that consumed ≥ 2 liters of water per day (P < 0.05).This study agrees with **Calomino *et al*., (2010)** who demonstrated that the concentration of urea in the blood decreased by up to 40% after drinking a large amount of water within 24 hours. The concentration of these metabolites decreases with increasing concentration of primary metabolites.

**Table (4): Serum Creatinine of participants before and after the experiment ( 4 months)**

| **Groups** | **Serum Creatinine** | | |
|---|---|---|---|
| | **Before** | **After** | **P. value** |
| G1(ControlNegative group) | 0.83±0.28 | 0.93±0.35 | P > 0.05 |
| G2(medical treatment only at a dose 0.5 mg of colchicine twice daily ) | 3.6±2.29 | 1.0±0.43 | P < 0.01 |
| G3(2.5Lwater plus at a dose 0.5 mg of colchicine twice daily ) | 3.4±2.84 | 0.58±0.65 | P < 0.01 |
| P. value between groups 1&2 between Pre. and Post | ( P < 0.01)<br>(0.83 - 0.93) vs (3.6 - 1.0)<br>(0.1) vs (2.6) | | |
| P. value between groups 1&3 between Pre. and Post | ( P < 0.01)<br>(12.4 -11.90 ) vs (3.4 -0.58)<br>(0.1) vs (2.82) | | |
| P. value between groups 2&3 between Pre. and Post | ( P > 0.05)<br>(3.6 - 1.0 ) vs (3.4 - 0.58 )<br>(2.6) vs (2.82) | | |

values are expressed as mean ±Standard Deviation SD.

The statistical analysis of creatinine levels in the participants, as shown in **Table 4**, These results indicated that drug treatment combined with adequate water intake can effectively lower creatinine levels in the blood, thereby improving kidney function. The difference in creatinine levels in groups G2 and G3 before and after the experiment was highly significant (P < 0.01), more so than in group G1 .

Group G3, who consumed 2.5 liters of water, showed the most significant improvement in blood creatinine levels. Their creatinine levels decreased from 3.4 before treatment to 0.58 after treatment, a statistically significant decrease ($P < 0.01$), indicating a substantial improvement in kidney function. In contrast, group G2, who only received drug treatment, showed a smaller improvement, with creatinine levels decreasing from 3.6 to 1.0. Thus, group G3 demonstrated the most effective reduction in creatinine levels compared to the other groups.

Our results indicated a negative correlation between the volume of water intake and blood creatinine levels. Furthermore, water intake was also strongly negatively associated with creatinine levels ($P < 0.01$). Dehydration can lead to increased creatinine concentrations in the blood, so drinking enough water can help maintain kidney function and lower blood creatinine levels. These findings align with those of **Unal *et al*. (2017)**, who found that blood creatinine levels were significantly higher in the group that consumed less than 2 liters of water per day compared to the group that consumed 2 liters or more ($P < 0.05$).

Our study also was similar with the findings of **Calomino *et al*. (2010)**, who found that blood creatinine concentration decreased by up to 20% after drinking water within 30 minutes. The concentration of these metabolites decreases with the increasing concentration of primary metabolites.

**Table (5): The level of hemoglobin (AIc) in the blood of participants before and after the experiment ( 4 months)**

| Groups | Hemoglobin(AIc) | | |
|---|---|---|---|
| | **Before** | **After** | **P. value** |
| G1( Control Negative) | 12.4 ± 1.26 | 11.90 ± 1.66 | P > 0.05 |
| G2(medical treatment only at a dose 0.5 mg of colchicine twice daily ) | 10.8 ± 1.79 | 10.90 ± 1.37 | P > 0.05 |
| G3(2.5L water plus at a dose 0.5 mg of colchicine twice daily) | 11.23 ± 1.65 | 13.1 ± 1.3 | P < 0.01 |
| P. value between groups 1 and 2 Pre. and Post | ( P > 0.05 )<br>(12.4 -11.90 ) vs (10.8 - 10.90 )<br>(0.5) vs (0.1) | | |
| P. value between groups 1and 3 Pre. and Post | ( P < 0.01)<br>(12.4 -11.90 ) vs (7.3 -3.9 )<br>(0.5) vs (1.87) | | |
| P. value between groups 2 and 3 Pre. and Post | ( P < 0.01)<br>(10.8 - 10.90 ) vs (11.23 - 13.1 )<br>(0.1) vs (1.87) | | |

values are expressed as mean ±Standard Deviation SD

According to the statistical analysis of the level of hemoglobin (AIc) in the blood of participants before and after the experiment (4 months) in **Table 5**. In this study, we found that drinking water may improve anemia by increasing the hemoglobin index (AIc). It was observed that there was a very significant difference in G2 and G3 with a p value greater than 0.01 ($P < 0.01$), before and after the experiment, compared to G1 . It is also clear that G3, who consumed 2.5 liters of water daily, showed the greatest improvement in hemoglobin levels in the blood. The hemoglobin level in this group increased from 11.23 to 13.1 after treatment, representing a statistically significant decrease (p value greater than 0.01) and indicating a significant improvement in kidney function. In contrast, G2, who received only drug treatment, showed less improvement, with a lower Hemoglobin levels from 10.8 to 10.90. Therefore, based on the data presented, the G3 group showed the most effective reduction in hemoglobin levels compared to the other groups, indicating that water aids in hemoglobin synthesis.

When considering the role of water in helping to form hemoglobin, lack of fluid intake can be a cause of anemia. Therefore, it can be seen that the anemia that occurs when a person is dehydrated is a condition in which there is a change in the size of smaller red blood cells accompanied by a decrease in hemoglobin **(Wahyuningsih *et al*.,2020).**Our findings are supported by **Salvai *et al*. (2003)** who found that a large number of water molecules are required for the allosteric regulation of hemoglobin, from an anoxic stressed state to an oxygenated relaxed state. Furthermore, water plays a role in the allosteric constant. Therefore, regular water intake may affect hemoglobin synthesis, thus alleviating anemia.

This study is consistent with **Kim *et al*. (2017)** who found that continuous and sufficient water intake may contribute to alleviating anemia by increasing hemoglobin.

**Table (6): The level of glucose in the blood of participants before and after the experiment ( 4 months)**

| **Groups** | **Blood glucose** | | |
|---|---|---|---|
| | **Before** | **After** | **P. value** |
| G1( Control Negative) | 125.8 ± 10.3 | 117.4 ± 10.52 | P > 0.05 |
| G2(medical treatment only at a dose 0.5 mg of colchicine twice daily ) | 121±13.9 | 126.8±15.93 | P > 0.05 |
| G3(2.5L water plus at a dose 0.5 mg of colchicine twice daily) | 159.8±77.15 | 106.2±10.5 | P < 0.05 |
| P. value between groups 1 and 2 Pre. and Post | ( P > 0.05)<br>(117.4 -125.8 ) vs (126.8-121)<br>(8.4) vs (5.8) | | |
| P. value between groups 1and 3 Pre. and Post | ( P < 0.05)<br>(117.4 -125.8 ) vs (106.2 -159.8)<br>(8.4) vs (53.6) | | |
| P. value between groups 2 and 3 Pre. and Post | ( P < 0.05)<br>(126.8-121) vs (106.2 -159.8)<br>(5.8) vs (53.6) | | |

values are expressed as mean ±Standard Deviation SD

**Table 6** displays the specific effects (drug treatment or water intake) on blood glucose levels for three different groups before and after the trial (4 months). It was found that there was no significant improvement in reducing blood sugar levels in G3 (P < 0.05) compared to G1 and G2 . This is due to the effect and role of water intake G3. It was observed that 2.5 liters of water plus a dose of 0.5 mg of colchicine twice daily applied to G3 had a better effect in lowering blood sugar levels (159.8±77.15 to 106.2±10.5). From G2 (121±13.9 to 126.8±15.93) and G1(125.8±10.3 to 117.4±10.52). Several reports have documented impaired glucose metabolism by plasma hypertonicity, an indicator of cellular dehydration **(Stookey *et al* .,2004**). In this context, dehydration has been suggested to be an additional factor contributing to the development of insulin resistance and the risk of diabetes. One study found that the more hydrated people were, the lower their fasting blood sugar and insulin levels. Participants who were the least hydrated were more likely to develop diabetes than those who were the most hydrated.**(Vanhaecke ،. *et al*2021)**

One previous study indicated in its results that water intake is associated with a lower risk of developing type 2 diabetes in women and men. **(Janbuzorgi *et al*., 2021**)

**Table (7): Serum uric acid of participants before and after the experiment ( 4 months)**

| **Groups** | **Uric acid in the blood** | | |
|---|---|---|---|
| | **Before** | **After** | **P. value** |
| G1( Control Negative) | 3.9 ± 1.12 | 4.0 ± 0.93 | P > 0.05 |
| G2(medical treatment only at a dose 0.5 mg of colchicine twice daily ) | 8.6 ± 0.9 | 5.4 ± 0.9 | P < 0.01 |
| G3(2.5L water plus at a dose 0.5 mg of colchicine twice daily) | 7.3 ± 18.7 | 3.9 ± 0.8 | P < 0.01 |
| P. value between groups 1 and 2 Pre. and Post | ( P < 0.01) (3.9 - 4.0 ) vs (8.6 - 5.4 ) (0.1) vs (3.2) | | |
| P. value between groups 1and 3 Pre. and Post | ( P < 0.01) (4.0 -3.9 ) vs (7.3 - 3.9 ) (0.1) vs (3.4) | | |
| P. value between groups 2 and 3 Pre. and Post | ( P > 0.05) (8.6 - 5.4 ) vs (7.3 - 3.9 ) (3.2) vs (3.4) | | |

values are expressed as mean ±Standard Deviation SD

Regarding, the statistical analysis of Serum uric acid of participants before and after the experiment in **Table 7,** The results of our analysis demonstrated a statistically significant difference in SUA between patients with elevated and normal sUA levels. Where it was found that G2 and G3 had a very highly significant effect in reducing uric acid levels in the blood ($P < 0.01$) compared to G1. Also, we found that G3 showed better improvement, as blood uric acid levels decreased from ($7.3 \pm 18.7$) to ($3.9 \pm 0.8$) compared to G2 decreased from ($8.6 \pm 0.9$) to ($5.4 \pm 0.9$) and G1 increased from ($3.9 \pm 1.12$ ) to ($4.0 \pm 0.93$). Which means that the combination of both treatments (drug treatment and drinking water) in G3 helped better and faster in reducing blood uric acid levels, unlike drug treatment only in G2. This indicates that drinking a sufficient amount of water has a strong and effective role in reducing blood uric acid levels, increasing urine volume, and smoothly getting rid of blood uric acid crystals.

This study agreed with **Shi *et al*. (2020)** they concluded that drinking plenty of water helps dilute uric acid in the blood, support healthy kidney function, and facilitate the smooth elimination of uric acid from the body. Previous research has also shown that water helps eliminate excess uric acid in the body and compensates for those suffering from dehydration **( cypiene *et al*., 2023).**

**Conclusion:** In general, G2 and G3 showed a decrease in uric acid in the blood compared to G1. The changes were more noticeable and effective in the G3 group, which received 2.5L of water due to the arithmetic average values before and after applying the experiment.This indicates that consuming a sufficient amount of water reduces the symptoms of hyperuricemia and helps reduce uric acid levels in the blood in patients suffering from hyperuricemia.

## Reference

**Abujbara, M.; Al Hourani, H.; Al-Raoush, R.; Khader, Y. and Ajlouni, K.(2022).** "Prevalence of Hyperuricemia and Associated Factors Among Type 2 Diabetic Patients in Jordan". Int J Gen Med. 15: 6611– 6619.

**Al-Ghamdi, Y.; Alsloli, M. and Alamri, Z.(2023).** "Effect of diuretic medication and coffee consumption on serum uric acid levels". JCIMCR. 4(8):2766-7820.

**Calomino, F.; Paolo, N.; Nicolai, G. and Miglio, A.(2010).** "Mineral water administration may increase kidney elimination of urea, creatinine and folic acid in a concentration-dependent fashion". Int J Artif Organs. 33(5):317-20.

**Cypiene, A.; Gimzauskaite, S.; Rinkuniene ,E.; Jasiunas ,E.; Rugiene ,R.; Kazenaite ,E.; Ryliskyte, L. and Badariene, J.(2023). "**The Association between Water Consumption and Hyperuricemia and Its Relation with Early Arterial Aging in Middle-Aged Lithuanian Metabolic Patients". Nutrients. 15(3): 723.

**Duncan, B. (2015). "**Multiple ranges and multiple F test**"**. Biometrics. (11): 1-42.

**George, C.; Leslie, S. and Minter, D.(2023).** "Hyperuricemia". National Library of Medicine.( 94).

**Janbozorgi ,N.; Allipour ,R.; Djafarian ,K.; Shab-Bidar , S.; Badeli ,M. and Safabakhsh,M.(2021).**"Water intake and risk of type 2 diabetes". Diabetes Metab Syndr.15(4):102156.

**Jin,M.; Yang,F.; Yang,I.; Yin,Y.; Luo,J.; Wang,H. and Yang,X.(2012).** " Uric Acid, Hyperuricemia and Vascular Diseases". Front Biosci. 17: 656–669.

**Kim, H.; Kim, S. and Ryu, J.(2017).** "Changes in the Blood Components Caused by Water Intake". Korean J Clin Lab Sci 49:227-232 .

**Kuriyan,R.; Thomas,T.; Ashok,S.; Jayakumar, J. and Kurpad,A.(2014).** " A 4-compartment model based validation of air displacement plethysmography, dual energy X-ray absorptiometry, skinfold technique & bio-electrical impedance for measuring body fat in Indian adults". Indian J Med Res. 139(5): 700–707.

**Lieske, J.; Lin, Z.; Li, Y. and Jayachandran, M.(2019).** "High water intake in preventing the risk of Uric Acid Nephrolithiasis: A systematic review and meta-analysis". J Clini Nephrol. 3: 126-142.

**Masot, O.; Miranda, J.; Santamaria, A.; Pueyo, E.; Pascual, A. and Botigue, T.(2020).** "Fluid Intake Recommendation Considering the Physiological Adaptations of Adults Over 65 Years: A Critical Review". Nutrients.12(11): 3383.

**Miller, A. and Adeli, K. (2008).** "Dietary fructose and the metabolic syndrome". Curr. Opin. Gastroenterol. 24 (2): 204–9.

**Mishra P., Singh U., Pandey C., Mishra P and Pandey G. (2019).** Application of student's t-test, analysis of variance, and covariance. Annals of cardiac anaesthesia, 22(4), 407–411.

**Nuttall, F. Body Mass Index: Obesity, BMI, and Health.(2015).** Nutr Today.50(3):117-128.

**Otani, N.; Ouchi, M.; Mizuta, E.; Morita, A.; Fujita, T.; Anzai, N.; and Hisatome, I. (2023).** " Dysuricemia—A New Concept Encompassing Hyperuricemia and Hypouricemia". Biomedicines. 11(5), 1255.

**Qi,M.; Santos, H.; Pinheiro,P.; McGuinness,D. and Bennett, K.(2023).** " Demographic and socioeconomic determinants of access to care: A subgroup disparity analysis using new equity-focused measurements".PLoS One. 18(11): e0290692.

**Russell, D. (2013).** Mstat director crop and soil sciences department, Michigan State University, (7);63-78.

**Salvay,A.; Grigera,J.and and Colombo,M.(2003).** " The Role of Hydration on the Mechanism of Allosteric Regulation: In Situ Measurements of the Oxygen-Linked Kinetics of Water Binding to Hemoglobin".Biophys J. 84(1): 564–570.

**Shi, H.; Liang, X.; Huang, L.; Luo, Z. and Tan, L.(2020).** "Electrolytic drinking water improves the metabolism of uric acid in the SD rats with hyperuricemia". Wei Sheng Yan Jiu. 49(5):802-808.

**Song, P.; Wang, H.; Xia, W.; Chang, X.; Wang, M. and An, L.(2018).** "Prevalence and correlates of hyperuricemia in the middle-aged and older adults in China". Sci Rep. 8: 4314.

**Stookey, J.; Pieper, C. Cohen, H. (2004).** " Hypertonic hyperglycemia progresses to diabetes faster than normotonic hyperglycemia". Eur J Epidemiol.;19(10):935–944.

**Thornton, S.(2016).** "Increased Hydration Can Be Associated with Weight Loss". Front Nutr. 3: 18.

**Unal, K.(2017).** " The Effect Of Daily Water Intake On Blood Biochemical Markers In Healthy Individuals". Turjoem 2017; Volume 2, Issue 1(3): 230-237.

**Vanhaecke, T.; Dolci,A.; Fulgoni,V. II,2 and Lieberman,H.(2021).** " Associations between urinary hydration markers and metabolic dysfunction: a cross-sectional analysis of NHANES data, 2008–2010". Eur J Nutr. 60(8): 4229–4241.

**Wahyuningsih,U.; Putri,F.; Sari, A.and Syah, M.(2020).** " Relationship Between Hydration Status and Anemia Status in Female Students at SMK Bekasi City" . Atlantis Press.30.

**Wang , R.; Hou, Y.; Ma ,R.; Gao, S.; Kaudimba, K.; Yan, H.; Liu, T. and (2021).** " The Effect of Low and Moderate Exercise on Hyperuricemia: Protocol for a Randomized Controlled Study". Front. Endocrinol.12.

**Warrier,V.; Krishan,K.; Shedge,K.and Kanchan,T.(2023).** Height Assessment. StatPearls. Treasure Island (FL): StatPearls Publishing, . Retrieved July 25, 2023.

**Weir, C. and Jan, A.(2023).** "BMI Classification Percentile And Cut Off Points". StatPearls. Treasure Island (FL): StatPearls Publishing, . Retrieved June 26, 2023.

**Yamamoto, T. (2008).** "Definition and classification of hyperuricemia". Nippon Rinsho (in Japanese). 66 (4): 636–40.

**Zeng, J.; Lawrence,W.; Yang, J.; Tian,J.; Li,C.; Lian,W.; He,J.; Qu,H.; Wang,X.; Liu,H.; Li,G. and Li,G. (2021).** "Association between serum uric acid and obesity in Chinese adults: a 9-year longitudinal data analysis". BMJ Open.11(2): 041919.

**Zhang,X.; Meng,Q.; Feng,J.; Liao,H.; Shi,R.; Shi,D.; Renqian,L.; Langtai,Z.; Diao,Y. and Chen, X.(2018).** " The prevalence of hyperuricemia and its correlates in Ganzi Tibetan Autonomous Prefecture, Sichuan Province, China".Lipids Health Dis. 17: 235.

**Zitt, E.; Fischer, A.; Lhotta, K.; Concin, H. and Nagel, G.(2020).** " Sex- and age-specific variations, temporal trends and metabolic determinants of serum uric acid concentrations in a large population-based Austrian cohort". Sci Rep.10: 7578.

# تاثير شرب الماء على مرضى ارتفاع مستوى حمض يوريك الدم


## المستخلص :

هدفت الدراسة لمعرفة دور شرب كمية كافية من المياه طوال اليوم في المساعدة على تقليل أعراض فرط حمض يوريك الدم وخفض مستويات حمض اليوريك في الدم لدى مرضى فرط حمض يوريك الدم. شارك في هذه الدراسة ٣٠ فرداً من المرضى ( منهم ٧ ذكور و ٢٣ انثى ) أعمارهم أكبر من ١٨ سنة، تم تقسيمهم إلى ٣ مجموعات متساويين. المجموعة الاولى ( كان مجموعة السيطرة السلبية )، المجموعة الثانية ( كانت المجموعة الضابطة الإيجابية التي تم إعطاؤها علاجاً طبياً فقط بجرعة ٠.٥ ملغ من الكولشيسين مرتين يومياً )، والمجموعة الثالثة ( كانت مرضى فرط حمض يوريك الدم التي تم إعطاؤها ٢.٥ لتر من المياه يومياً بالإضافة إلى العلاج الطبي بجرعة ٠.٥ ملغ من الكولشيسين مرتين يومياً ) لمدة أربعة أشهر. حيث تم اخذ القياسات البشرية بما في ذلك وزن الجسم والطول ومؤشر كتلة الجسم وكذلك اختبارات الدم لقياس حمض اليوريك، والهيموجلوبين، نتروجين اليوريا ، الكرياتينين وجلوكوز الدم. وأظهرت هذه النتائج أن المجموعة الثانية والمجموعة الثالثة كان لهما تأثير معنوي كبير جداً(البي فاليو اقل من ١%) في تقليل مستويات حمض يوريك الدم مقارنة بالمجموعة الاولى ، لكننا وجدنا أن المجموعة الثالثة أظهرت تحسناً أفضل، حيث انخفضت مستويات حمض البوليك في الدم من (٧.٣ ± ١٨.٧) إلى (٣.٩ ± ٠.٨) مقارنة بـ المجموعة الثانية حيث انخفضت من(٨.٦ ± ٠.٩) إلى (٥.٤ ± ٠.٩) والمجموعة الاولى ارتفعت من (٣.٩ ± ١.١٢ ) إلى (٤.٠ ± ٠.٩٣).لذلك أوصت هذه الدراسة بشرب ٢٠٠٠ –٣٠٠٠ مل أو ٢.٥ لتر من المياه يومياً، على أن تكون فترات تناول الماء متباعدة واستهلاكها بشكل مستمر طوال اليوم، لما له من دور كبير في تقليل أعراض ارتفاع حمض يوريك الدم وتقليل مستوى حمض يوريك الدم .



## الكلمات المفتاحية:

**ارتفاع مستوى حمض يوريك الدم، حمض البوليك، شرب الماء، النقرس، حصوات الكلى.**