

The Relation of Serum Sodium, Potassium and Magnesium with Rheumatoid Arthritis Symptoms

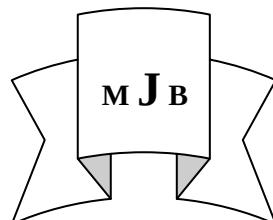
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Abstract

This study was aimed to determine sodium, potassium and magnesium levels in rheumatoid arthritis patients. The study included 24 patients (male only) aged 33-40 years compared with 20 volunteers as the same sex and aged as a control group. Mean $\pm$ SD of serum sodium, potassium and magnesium in patients were 182.568 ± 22.745 , 0.973 ± 0.219 and 0.502 ± 0.085 mmol/L while control group were 125.047 ± 23.257 , 3.475 ± 0.818 and 0.941 ± 0.067 mmol/L respectively. The study showed a significantly increase in Na level p-value(0.00) and significantly decreased in K and Mg levels in patients compared with control group p-value(0.00, 0.00). The correlation factor was determined between K and Mg ($r = 0.536$).

الخلاصة

تهدف هذه الدراسة إلى تقدير مستويات الصوديوم، البوتاسيوم والمغنيسيوم لدى المرضى المصابين بالتهاب المفاصل الروماتزمي. تضمنت الدراسة ٢٤ مصاب من الرجال فقط تتراوح أعمارهم بين ٣٣-٤٠ سنة مقارنة مع ٢٠ شخص من نفس الجنس والفئة العمرية. كانت معدلات الصوديوم، البوتاسيوم والمغنيسيوم لدى المرضى 182.568 ± 22.745 ، 0.973 ± 0.219 و 0.502 ± 0.085 ملمول لكل لتر أما معدل هذه العناصر لدى مجموعة السيطرة فقد كان 125.047 ± 23.257 ، 3.475 ± 0.818 و 0.941 ± 0.067 ملمول لكل لتر بالتتابع. بينت الدراسة ظهور زيادة معنوية في مستوى الصوديوم (P-value) هي (٠.٠٠٠) ونقصانا معنويا في مستويات كلا من البوتاسيوم والمغنيسيوم لدى المرضى مقارنة بالأصحاء (P-value) هي (٠.٠٠٠، ٠.٠٠٠) على التوالي. تم إيجاد عامل الارتباط بين كلا من البوتاسيوم والمغنيسيوم حيث وجد بأنه يساوي (0.536).

Introduction

Rheumatoid arthritis (RA) is a chronic autoimmune disease that causes inflammation and deformity of the joints, other systemic problems of the body may also develop including inflammation of blood vessels, lung disease, blood disorders, and osteoporosis[1]. RA can begin gradually, the first symptoms of RA are pain, swelling and stiffness in the joints[2]. The most normally involved joints include hands, feet, wrists, elbows and ankles, although other joints may also be involved, the joints may be difficult to straighten and affected fingers and toes may be permanently bent, the hands and feet

may curve outward in an abnormal way[3]. RA causes stress and elevated blood pressure by relating with chemical elements for different functions as the same as sodium (Na), potassium (K) and magnesium (Mg), these elements are able to conduct an electrical current each these minerals called electrolytes, they are worked with water in maintaining fluid and electrolyte homeostasis in generating and conducting electrical impulses across cell membranes in muscle function [4,5]. Human body require only 500 milligrams (mg) of sodium per day to work properly and that amount is easily met in a typical diet, when taking salt too much that is

lead to a bad effects on brain, heart and muscles, people with (RA) may benefit more than others by monitoring salt intake, eating less salt caused the loss of calcium from bones then reducing the risks of osteoporosis and fractures[6]. Potassium is important for resisting bacterial disease, rheumatoid arthritis is proposed to be greatly proven by potassium deficiency, hormones which are regulated by regulating potassium, such as cortisol, that is reduced during a potassium deficiency and this reduction accounts for many symptoms of RA[7]. No bodily system can escape without being insulted by magnesium in fact, it is thought to promote genomic stability, it turns out that nearly all DNA synthetic and repair enzymes require

magnesium[8]. Magnesium supplement has a great effect on depression and muscles function as well as the smooth muscles of blood vessels and the gastrointestinal tract[9]. Some fuels cannot be stored in the muscle cells unless adequate supplies of magnesium are available, the metabolic role of magnesium is so diverse that it is difficult to find a body system that is not affected by magnesium deficiency[10].

Material And Methods

Reagents:

1. Stock lithium nitrate (1 mol/L), 68.95 g of LiNO_3 was added to a 1L volumetric flask containing deionized water.
2. Working lithium nitrate, a volume of 15 ml of stock LiNO_3 was diluted to 1L with deionized water.
3. Stock sodium chloride standard (1 mol/L), 58.45 g of NaCl was added to a 1L flask containing deionized water.
4. Stock potassium chloride standard (100 mmol/L), 7.45 g of KCl was added to a 1L flask containing deionized water.

5. Working serum standard, 140 ml of NaCl stock and 5 ml of KCl stock were added to 1L volumetric flask and diluted to volume with deionized water.

6. Lanthanum chloride stock reagent, 81.5 g of lanthanum oxide (La_2O_3), 435 ml of concentrated HCl in 1 L volumetric flask then complete the volume with deionized water.

7. Working lanthanum, 20 ml of lanthanum Stock solution was diluted to 1L volume with deionized water.

8. Stock magnesium standard, 100 mg of magnesium was dissolved in 100 ml deionized water.

9. Working standards for magnesium, three concentrations of working standards were used then added 50 ml deionized water to each of three 100 ml volumetric flask.

Methods:

The concentrations of sodium and potassium were determined by atomic emission, magnesium concentration in the samples can be determined by atomic absorption spectrophotometry. [11,12]

Patients:

Blood samples were collected from 24 patients (men only), aged 33-40 years and 20 apparently healthy men were used as a control group, all samples of patients are collected from Morjan hospital. After clotting serum was separated by centrifugation at 3000 rpm, the analytical determinations described below were either performed immediately or stored at 5°C for used within 72 hours.

Statistical analysis:

All results are expressed as a mean $\pm$ SD (standard deviation), comparison between patients and controls were performed by the student's t- test. A value of $p \leq 0.05$ was considered statistically significant. The correlation between parameters under study were measured to find a correlate factor ($r=0.536$).

Results and Discussion

The results were analyzed by using student's t test. Significant increase

was found for Na concentration ($p=0.00$) in patients when compared with control group show in fig.(1).

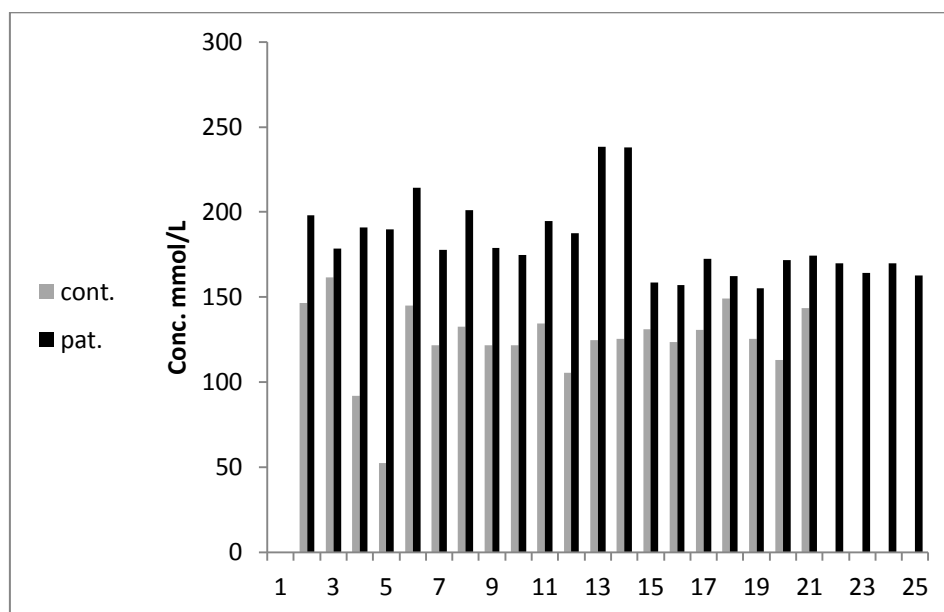


Figure1 The concentration of sodium in (RA) patients compared with control group.

Sodium levels associated with increasing an inflammation joints such as rheumatoid arthritis, salt consumption can be harmful if excessive, due to high concentration of

sodium correlated with early rheumatoid arthritis activity and it is an excellent predomance of pro-inflammatory hormones [13,14].

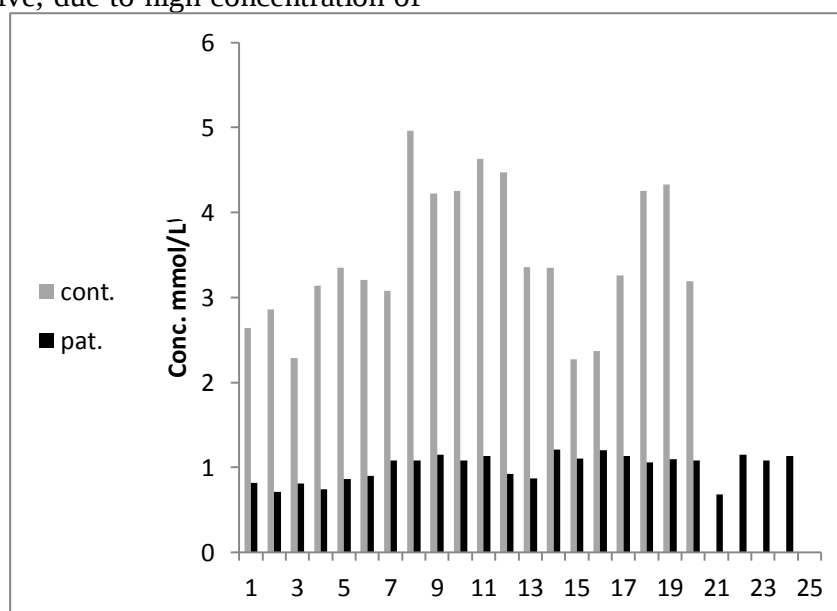


Figure2 The concentration of potassium in (RA) patients compared with control group.

Patients with rheumatoid arthritis tend to have a poorer ability to conserve or absorb potassium than other people because of weakness in

immune system, the necessary to survive potassium loss during virulent diarrhea has set people up in the course of evolution for some of the worst

symptoms of rheumatoid arthritis [15]. This study obtained significantly decreased in potassium concentration

($p=0.00$) in patients compared with healthy control show fig.(2).

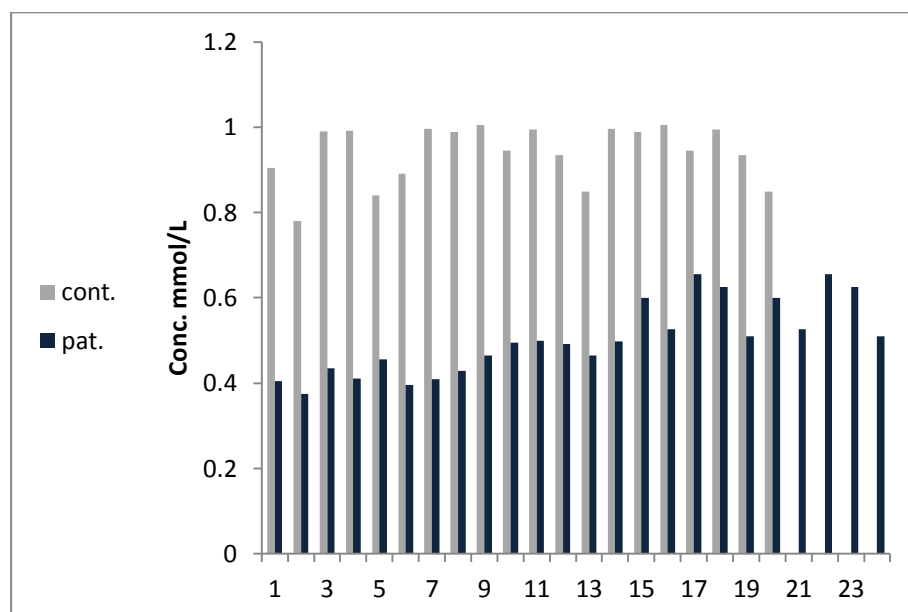


Figure 3 The concentration of magnesium in (RA) patients compared with control group.

The body employs magnesium that it plays a role in RA, one of the most important roles of Mg involves maintenance of the intracellular environment and primarily by attaching to phospholipids in membranes both of the cell wall and cell organelles to reduce their permeability and enhance polarizing electrostatic effects [16]. It also extracellular magnesium is in equilibrium with that in the bones and

soft tissues, the results obtained significantly decreased in patients compared with healthy control (p -value = 0.00) show fig.(3), since magnesium suppresses PTH (a mineral transport hormone) and stimulates calcitonin and it helps remove calcium from soft tissues eliminating of arthritis therefore reduce calcitic arthritis by providing more magnesium absorption [17].

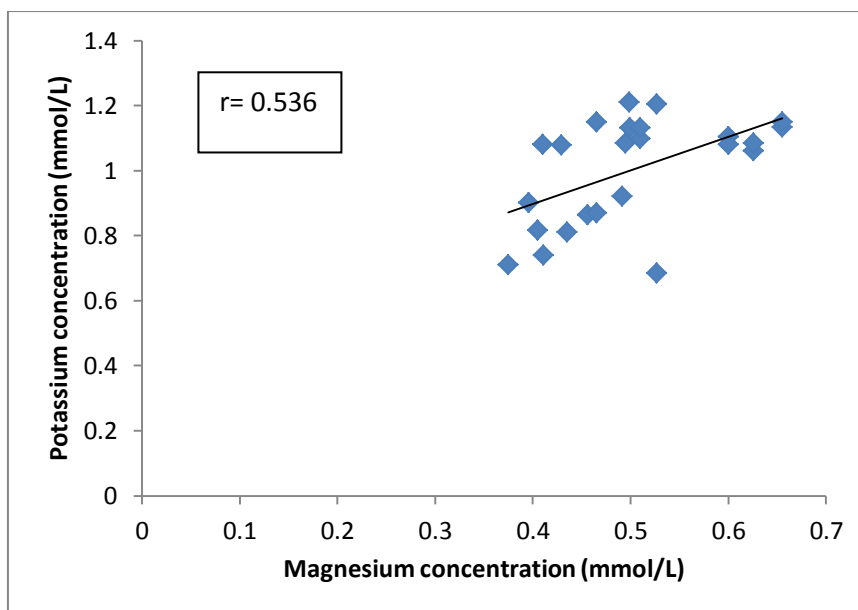


Figure 4 The correlation between magnesium and potassium concentration in (RA) patients.

The results obtained relation between magnesium and potassium ($r=0.536$), the affecting in both the peripheral and central immune system, muscles become hyperexcitable with magnesium insufficiency and caused imbalances of electrolyte homeostasis[18]. Magnesium deficiency impaired effectively of the sodium/potassium pump, whereby insufficient potassium can be pumped into the cell. Therefore the magnesium deficiency will be caused for potassium deficiency[19].

Conclusions

Rheumatoid arthritis is related with largely a chronic potassium and magnesium deficiency.

- 1- The interference by sodium with enzymes inside the cell caused largely increase of sodium in (RA) patients.
- 2- The results shown a relation between potassium and magnesium in (RA) patients.
- 3- There is no relationship between sodium and other metals under study.

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