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The Promising Role of Magnesium Taurate in Managing Hypertension

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Abstract

Magnesium taurate may assist hypertensive individuals in reducing their blood pressure. The potential benefits of magnesium taurate in the treatment of hypertension and the general safety and ease of use of supplements provide support for this theory. The study aim To examine the effectiveness of magnesium taurate for management of hypertension and reduction levels of blood pressure in individuals with chronic hypertension. This study was included 164 individuals whose ages between (40-70) years. They were divided into two groups. The group I contain 82 healthy people that individuals without hypertension and group II contain 82 patients with hypertension. The 20 patients (10 men, 10 women) selected from group II were given a supplement known as magnesium taurate (500 mg per day) for one month (30 days) (depending on the FDA). Both groups were analyzed serum cortisol, magnesium and potassium as well as measure systolic and diastolic blood pressures for both groups daily and take reading weekly before and after given supplement nutrient. Study design: Two study design. First is cohort study design out-come of treatment is followed. Second is cross-sectional study. This study executed during the period from October 2023 to December 2024. Inclusion criteria: Hypertensive patient matching selection of study specification. Exclusion criteria: Hypothyroidism, hyperthyroidism - Cushing disease -Kidney disease - Heart disease - Women with poly cystic ovary syndrome (PCOS) - Pregnant women. Blood sample collection: Between 7.00 and 9.00 a.m., 10 ml of blood were drawn from all participants in the study via vein puncture, after overnight fasting (10-12) hour. A blood sample was left at room temperature 15 minute for clot formation and separated by centrifuge for 10 minutes at 3000rpm to collect serum and used to ass's serum biochemical parameters. Tests principle: Serum cortisol measured by using cobas e601 (immunoassay analyzer), total duration of assay: 18 minutes. Serum magnesium measured by using cobas c501 (auto analyzer), Serum potassium measured by using electrolyte analyzer (SENSA CORE). Results: After adjusting for the age between the two groups, the cortisol level showed a significant decrease in the level of serum cortisol (316.30±59.6 nmol/dl) and a significant increase in the levels of serum magnesium (2.01±0.27 mg/dl) and serum potassium (4.31±0.25 mmol/l) after administrating magnesium taurate with a significant decrease in the blood pressure level (systolic blood pressure (130.00±7.20 mmHg) and diastolic blood pressure (80.30±3.64 mmHg)). In conclusion magnesium taurate supplementation not only restored hypertension-associated declines in serum magnesium and potassium, but also led to a significant reduction in serum cortisol levels. These enhancements imply a possible therapeutic benefit in the management of hypertension, especially when combined with a significant drop in blood pressure.

Keywords | **Hypertension (high blood pressure), magnesium taurate, cortisol, potassium**

Introduction:

There is a complex web of relationships between insulin resistance, hypertension (high blood pressure), potassium, magnesium, and other physiological processes (2),(3). Potassium and magnesium are vital minerals that regulate blood pressure, proper heart and muscle function, and insulin resistance can lead to hypertension through a number of pathways, such as increased

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sympathetic nervous system activity, impaired endothelial function, and sodium retention (4),(28).A deficiency in magnesium and low potassium levels are both linked to an elevated susceptibility to hypertension. In addition to magnesium's function in vasodilation, potassium counteracts the hypotensive effects of sodium (5). Blood pressure may be positively impacted by addressing insulin resistance through lifestyle changes (such regular exercise and a nutritious diet). Sustaining appropriate potassium and magnesium levels can also help control blood pressure (26). The relationships among insulin resistance, potassium, magnesium, and hypertension entail complex physiological interactions (27). Making changes to one's lifestyle, such as eating a balanced diet, exercising regularly, and making sure one is getting enough nutrients, are essential for effectively managing these factors and enhancing cardiovascular well-being. It is always advisable to seek guidance and treatment from a healthcare professional for personalised recommendations (6),(7). Hypertension has been linked to reduced levels of magnesium and potassium, combined with an increase in serum cortisol (8). This introduction examines the interactive connection between these indicators and hypertension, focusing on the possible therapeutic benefits of magnesium taurate supplementation. (9), (10)

Subjects, Material, and Method:

The primary objective of this study was to examine individuals between the ages of 40 and 70, specifically targeting those with hypertension. Additionally, data was gathered from control subjects who had normal blood pressure. The gender distribution was meticulously balanced between the two groups. Initial assessments were conducted to measure the levels of cortisol, magnesium, and potassium in the serum. Out of the participants, 20 individuals were administered magnesium taurate at a dosage of(500mg/day) according to the FDA (1) for a duration of 30 days. After the supplementation, all measurements were repeated.

Result:

Individuals with hypertension exhibit a significant elevation in serum cortisol levels in comparison to those who do not have the illness.

Table .1 Comparative analysis of serum cortisol and hypertension status between individuals without hypertension and patients with hypertension expressed as: Mean ± standard deviation

Parameter	Individual without hypertension Mean±SD No: 82	Individual with hypertension Mean±SD N : 82	P-value (significant level)
S.Cortisol (nmol/dl)	317.69±88.90	490±135	P≤ 0.05 (s)
Systolic blood pressure(mmHg)	117.90±3.51	152±7.89	P ≤ 0.05 (s
Diastolic blood pressure(mmHg)	76.20±4.12	93.10±5.19	P ≤ 0.05 (s)

P ≤ 0.0001

The levels of minerals, specifically serum magnesium and potassium, are considerably lower in individuals with hypertension compared to those without hypertension (P < 0.05).

Table .2 Minerals differences (Mg^{++}, K^{+}) between individual with and without hypertension.

Parameter	Individual without hypertension Mean±SD No: 82	Individual with hypertension Mean±SD No: 82	P-value (significant-level)

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S. Mg^{++} (mg/dl)	1.89 ±0.24	1.78±0.21	0.0021 (s)
S.K^{+} (mmol/l)	4.30±0.23	3.99±0.17	0.0000 (s)

s: Significant, n.s: non- significant, No: The number

Table .3 illustrates the impact of a (500 mg/day) magnesium taurate supplement taken at night for 30 days on hypertension: Systolic and diastolic blood pressures, as well as serum cortisol, have been considerably decreased ($P < 0.05$).

Table .3 The impact of magnesium taurate on cortisol and blood pressure expressed as: mean ±SD

Parameters	Individual with hypertension before supplement Mean±SD No: 20	Individual with hypertension after supplement Mean±SD No: 20	P-value (The significant-level)
S.Cortisol (nmol/dl)	500±136	316±59.6	<0.0001 (s)
Systolic blood pressure(mmHg)	151±8.49	130±7.20	<0.0001 (s)
Diastolic blood pressure(mmHg)	92.10±5.31	80.30±3.64	<0.0001 (s)

It is noteworthy that there was a statistically significant increase ($P\leq 0.05$) in the levels of serum magnesium and potassium levels among individuals with high blood pressure following supplementation with magnesium taurate. This alteration has the potential to be advantageous for their overall well-being.

Table .4 The effect of magnesium taurate on magnesium and potassium levels in hypertensive patients is reported as: (mean ±SD)

Parameter	Individual with hypertension before supplement Mean±SD No: 20	Individual with hypertension after supplement Mean±SD No: 20	P-value (The significant-level)
S.Mg^{++} (mg/dl)	1.74 ± 0.22	2.01 ±0.27	0.0013 (s)
S.K^{+} (mm0l/l)	4.00 ± 0.2	4.28 ± 0.25	0.0004 (s)

The study emphasizes the inverse relationship between serum cortisol and serum magnesium and potassium levels in individuals with hypertension prior to obtaining magnesium taurate, as well as a direct relationship with systolic and diastolic blood pressure.

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Figure (1): Correlation of cortisol levels with serum magnesium in patients before using magnesium taurate.
r = -0.862, p= 0.000

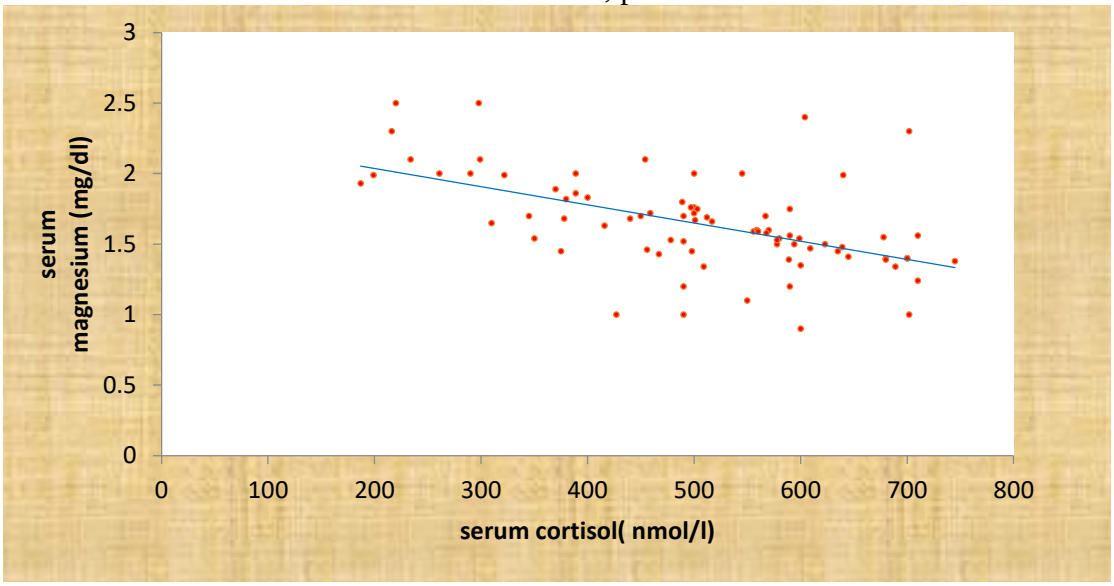

Figure (2): Correlation of cortisol levels with serum potassium in patients before using magnesium taurate
r = -0.595, P = 0.0001

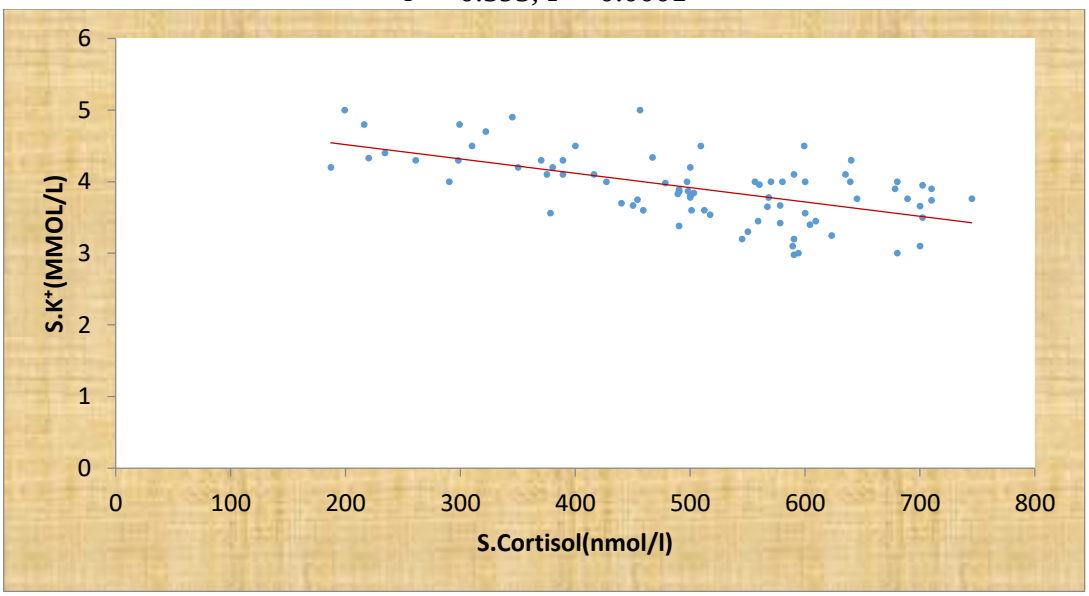

Figure (3): Correlation of cortisol levels with systolic blood pressure in patients before using magnesium taurate

r= 0.539, P= 0.000

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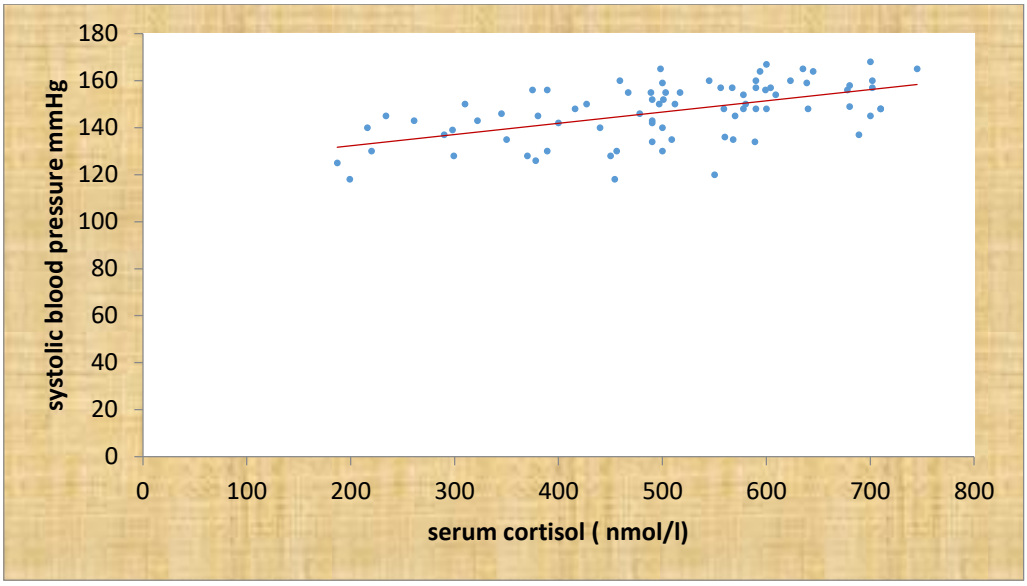
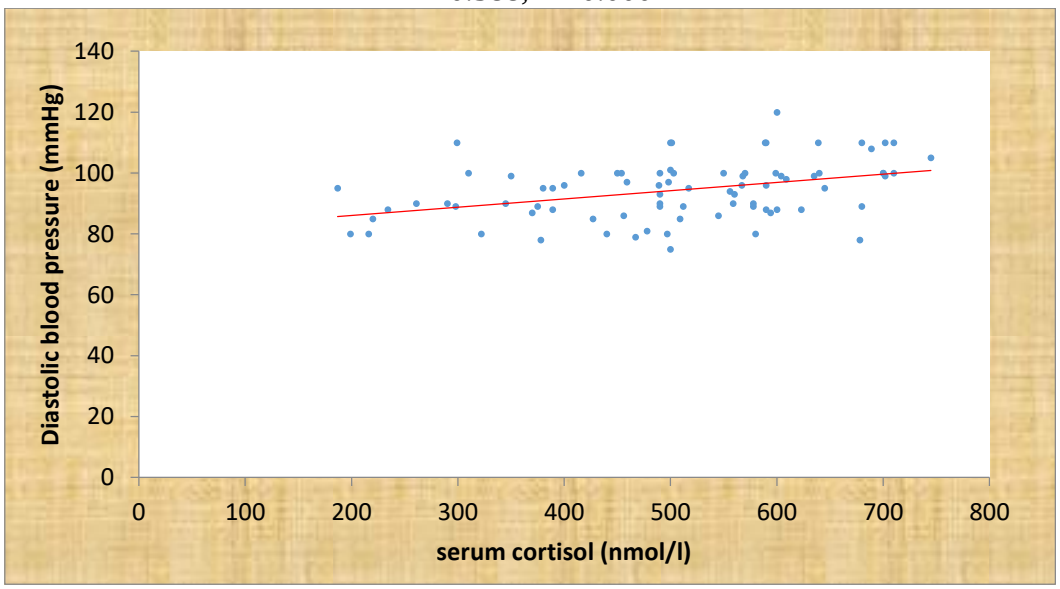


Figure (4): Correlation of cortisol levels with diastolic blood pressure in Patients before using magnesium taurate

r= 0.388, P= 0.000



Discussion:

The age was carefully matched and confirmed through non- significant result (p- >0.05) to eliminate the effect of age. People with hypertension are expected to have a higher BMI, as it is one of the contributing factors to hypertension. Matching is not a focus in our study since we do not delve into the specific causes of hypertension as indicated in Table (1)

There are many opinions about the level of magnesium in patients with high blood pressure, but all in the same line with our study, that it shows a reduction in its level (11) , but is it a cause of high blood pressure? Controversy is still ongoing about it, the study cannot answer it, as well as that is not among its goals, some opinions about its low level will be discussed below.

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Nevertheless, it is believed that Magnesium contributes to hypertension due to the potential of hypomagnesaemia to elevate intracellular calcium levels, leading to vasoconstriction (8). In simpler terms, Magnesium reduces the inhibitory activity of circulating Na^{+}-K^{+} ATPase, which helps to regulate vascular tone and decrease blood pressure (12).

Magnesium supplementation exhibited a modest reduction in blood pressure (13), (14). The impact on blood pressure escalated with doses over 370 mg per day (1). The onset of noticeable effects usually occurred during a span of 3 to 4 weeks (15).

The relationship between the levels of potassium and magnesium will determine the extent to which they are explained together (16), (17). The potassium level showed a significant reduction in individuals with high blood pressure (19).

Potassium and magnesium taurate are frequently taken as supplements to help control hypertension. Combining magnesium and taurine can result in magnesium taurate, which has the potential to relax blood vessels and enhance blood flow (20). On the other side, potassium balances the body's salt levels, which helps control blood pressure (21). Together, these supplements have the potential to improve cardiovascular health and possibly reduce blood pressure in hypertensive patients (22). It's crucial to speak with a medical expert before beginning a new supplement regimen.

Utilizing combinations of magnesium and potassium alongside low-sodium intakes proves to be more efficacious in decreasing blood pressure compared to the use of individual minerals (23). To achieve maximum reduction in blood pressure, it is advised to consume 1000 mg of magnesium, together with 4.7g of potassium and less than 1.5g of sodium per day, through a combination of dietary sources and supplements (24).

Nevertheless, the proper execution of these tasks by potassium is contingent upon the presence of magnesium. Magnesium plays a crucial role in facilitating the transportation of potassium into cardiac cells, hence promoting heart health (13), (25). This connection between the two ions is of utmost importance for the functioning of the heart (19), (21).

Disruptions in potassium balance do not cause any additional irregularities in the regulation of magnesium levels (18). On the other hand, when there are initial disruptions in the balance of magnesium, specifically a decrease in magnesium levels, it leads to a subsequent decrease in potassium levels (16).

Moreover, there is a strong association observed between the amounts of magnesium and potassium in tissues outside of the kidneys, specifically in skeletal muscle (14). A lack of magnesium triggers potassium depletion in both animals and humans.

The conclusion:

The significant decrease in cortisol levels indicates a possible involvement in regulating stress, while the considerable rise in magnesium and potassium levels shows a beneficial effect on maintaining mineral balance. Significantly, these modifications are associated with a significant reduction in blood pressure, suggesting possible therapeutic advantages. Although further study is required to comprehend the mechanics and long-term consequences, these findings indicate a viable approach for comprehensive hypertension care.

Author's declaration:

Conflicts of interest: None

We confirm that all tables and figures in this article are ours and written by the researchers themselves.

Ethical-Clearance: this manuscript approved by local ethical committee of physical education and sport sciences college for women on (February /2023)

Author's contributions:

All contributions of this study were done by the researchers (H.L. and M.J.) who get the main idea

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and work on writing and concluding also with number of experts, Huda Latif and Maysaa Jalil in Statistics, Stuart Biddle in revision, Haifaa Ahmed in proofreading

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الدور الواعد لتورات المغنيسيوم في إدارة ارتفاع ضغط الدم

هدى لطيف حسن 1 ، ميساء جلال مجيد 2
2&1 جامعة بغداد/ كلية الطب

مستخلص البحث

قد يساعد مغنيسيوم تورات الأشخاص المصابين بارتفاع ضغط الدم في خفض ضغط الدم لديهم. تقدم الفوائد المحتملة لمغنيسيوم تورات في علاج ارتفاع ضغط الدم وسهولة استخدام المكملات دعمًا لهذه النظرية. تهدف الدراسة إلى فحص فعالية مغنيسيوم تورات في إدارة ارتفاع ضغط الدم وخفض مستويات ضغط الدم لدى الأفراد الذين يعانون من ارتفاع ضغط الدم المزمن. شملت هذه الدراسة 164 فردًا تتراوح أعمارهم بين (40-70) عامًا. تم تقسيمهم إلى مجموعتين. المجموعة الأولى تحتوي على 82 شخصًا بصحة جيدة، بما في ذلك الأفراد بدون ارتفاع ضغط الدم، والمجموعة الثانية تحتوي على 82 مريضًا بارتفاع ضغط الدم، تم تناول عشرين منهم مغنيسيوم تورات لمدة شهر (30 يومًا). تم تحليل مستويات الكورتيزول والمغنيسيوم والبوتاسيوم في المصل، بالإضافة إلى قياس ضغط الدم الانقباضي والانبساطي لكلا المجموعتين قبل وبعد تناول المكملات الغذائية. النتائج: بعد تعديل العمر بين المجموعتين، أظهرت مستويات الكورتيزول انخفاضًا ملحوظًا في مستوى الكورتيزول في المصل (316.30±59.6 نانومول/ديسيلتر)، وزيادة ملحوظة في مستويات المغنيسيوم في المصل (2.01±0.27 ملغ/ديسيلتر) والبوتاسيوم في المصل (4.31±0.25 ملمول/لتر) بعد تناول مغنيسيوم تورات، مع انخفاض ملحوظ في مستوى ضغط الدم ضغط الدم الانقباضي (130.00±7.20 ملم زئبق) وضغط الدم الانبساطي (80.30±3.64 ملم زئبق). في الختام، يؤدي تكملة مغنيسيوم تورات ليس فقط إلى استعادة الانخفاضات المرتبطة بارتفاع ضغط الدم في مستويات المغنيسيوم والبوتاسيوم في المصل، ولكنها أيضًا تؤدي إلى انخفاض ملحوظ في مستويات الكورتيزول في المصل. تلك التحسينات تدل على فائدة علاجية محتملة في إدارة ارتفاع ضغط الدم، خاصة عندما يتم الجمع بينها وبين انخفاض ملحوظ في ضغط الدم.

الكلمات المفتاحية | **ارتفاع ضغط الدم ، تورات المغنيسيوم ، الكورتيزول ، البوتاسيوم .**