

ORIGINAL RESEARCH

Correlation Analysis of Serum Magnesium and Vitamin D Level in Vitamin D Deficient Patients and Vit D Sufficient Patients

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ABSTRACT

Introduction: In the body, nutrients normally work together in a coordinated fashion. The availability of certain nutrients influences the uptake of another nutrient in the intestine. Magnesium and vitamin D are two critical nutrients that are required for diverse organ physiologic activities.

Objectives: The present study was conducted to analyze the relationship between serum magnesium and vitamin D and to compare the levels of serum magnesium in vitamin D deficient patients and vit D sufficient patients.

Methods: Present study was a prospective, observational, cohort, single centric, hospital-based study conducted over the duration of one year. Total 100 patients were recruited in the study and relationship between Serum magnesium and vitamin D was assessed. According to the levels of vitamin D the patients were sub-grouped into three categories: Normal: Vitamin D ≥ 30 ng/ml (10 patients), Insufficient: Vitamin D ≥ 20 and ≤ 30 ng/ml (12 patients), and Deficient: Vitamin D ≤ 20 ng/ml (78 patients).

Results: Vitamin D in normal group was 54.68 ± 8.965 , in insufficient group was 25.79 ± 2.842 and in deficient group was 7.704 ± 3.909 . The difference between three group was significant. Magnesium in normal group was 1.572 ± 0.1098 , in insufficient group was 1.603 ± 0.1014 and in deficient group was 1.625 ± 0.1092 . The difference between three group was not significant. Correlation analysis of Vitamin D and magnesium revealed a negative correlation in normal group ($r = -0.3561$), and a positive correlation in insufficient group ($r = 0.1277$) and deficient group ($r = 0.01423$).

Conclusion: Based on serum magnesium levels, the research can assess the need for mediational cost and unfavourable side effects associated with multitherapy with vitamin D and magnesium, as per current clinical practise.

Keywords: Vitamin D, Magnesium, Homeostatis, Correlation.

INTRODUCTION

In the body, nutrients normally work together in a coordinated fashion. The availability of certain nutrients influences the uptake of another nutrient in the intestine. Magnesium and vitamin D are two critical nutrients that are required for diverse organ physiologic activities.¹ Vitamin D is a lipid-soluble vitamin that plays a variety of important cellular and molecular

roles. Vitamin D involve in cell growth and regeneration as well as play role in glucose homeostasis. It also contributes to the physiology of musculoskeletal system.²⁻⁷ Magnesium is the 4th most prevalent mineral in the body of humans. Magnesium regulate calcium levels by interacting with several enzymes.⁸ It plays role in routine cell function, nucleic acid synthesis, and tissue repair and oxidation-reduction reactions. It acts as cofactor for many transporters and enzymes.^{9,10} Maintaining the physiologic activities of many organs requires an optimal balance of magnesium and vitamin D. Abnormally high quantities of either of these nutrients can cause catastrophic organ damage.

Sustaining a healthy magnesium and vitamin D balance is critical for maintaining physiologic functioning. Vitamin D and magnesium have a synergistic relationship. Magnesium is required for the active form of vitamin D to be formed by the enzymes 25 hydroxylase and 1 hydroxylase, and vitamin D aids in intestinal magnesium absorption. Because of food processing and soil conditions, the magnesium level of our diet is gradually decreasing. Even the use of fertilizers and pesticides alters the soil quality, lowering magnesium levels. A lack of magnesium in the blood causes a drop in the active form of vitamin D. Magnesium intake has been proven in studies to reduce the risk of death linked with hypovitaminosis D. Dietary magnesium consumption and bone mineral density have been demonstrated to have a favorable relationship.¹¹ Therefore, the present study was conducted to analyze the relationship between serum magnesium and vitamin D and to compare the levels of serum magnesium in vitamin D deficient patients and vit D sufficient patients.

MATERIALS AND METHODS

PATIENT RECRUITMENT

Total 100 patients were recruited in the study. Patients already on magnesium supplementation, suffering from chronic illness, patients on long term proton pump inhibitor therapy, loop and thiazide diuretics etc. and seriously ill patients were excluded from the study. According to the levels of vitamin D the patients were sub-grouped into three categories: Normal: Vitamin D ≥ 30 ng/ml (10 patients), Insufficient: Vitamin D ≥ 20 and ≤ 30 ng/ml (12 patients), and Deficient: Vitamin D ≤ 20 ng/ml (78 patients).

VITAMIN D AND MAGNESIUM ANALYSIS

Vitamin D levels was measured using the form of 25-hydroxycholecalciferol(25OHD). For this venous blood was drawn and sent to lab for analysis of the level of vitamin D by Chemilumescence immunoassay (CLIA) method using CLIA VAST enabled kit (Advia Centor XP) supplied by Siemens (Germany). Magnesium levels was measured using calorimetric method by tulip kit. Mg combines with calmagite in an alkaline medium to form red colored complexes.

STATISTICAL ANALYSIS

Statistical analysis was performed using SPS student version (SPSS Inc, Chicago, USA) software. Mean and standard deviation was calculated and groups were compared by taking p value <0.05 as significant. Pearson correlation was used for correlation analysis.

RESULTS

The mean age of the recruited patients in the normal group was 31.10 ± 9.960 years, in insufficient group was 32.25 ± 13.92 years and in deficient group was 26.82 ± 6.040 years. The difference between three group was not significant. In the normal group, the number of males were 6 (60%) and number of females were 4 (40%). In the insufficient group, the number of males were 6 (60%) and number of females were 6 (50%). In the deficient group,

the number of males were 34 (43.59%) and number of females were 44 (56.41%%). The difference between three group was not significant.

Vitamin D in normal group was 54.68 ± 8.965 , in insufficient group was 25.79 ± 2.842 and in deficient group was 7.704 ± 3.909 (Figure 1).

The difference between three group was significant. Magnesium in normal group was 1.572 ± 0.1098 , in insufficient group was 1.603 ± 0.1014 and in deficient group was 1.625 ± 0.1092 (Figure 2). The difference between three group was not significant. Correlation analysis of Vitamin D and magnesium revealed a negative correlation in normal group ($r= -0.3561$, figure 3), and a positive correlation in insufficient group ($r=0.1277$, figure 4) and deficient group ($r=0.01423$, figure5).

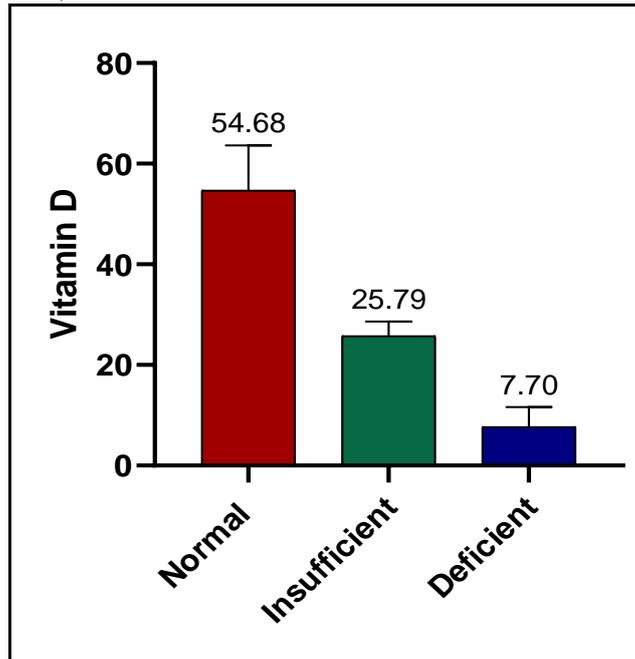


Figure 1: Vitamin D Levels.

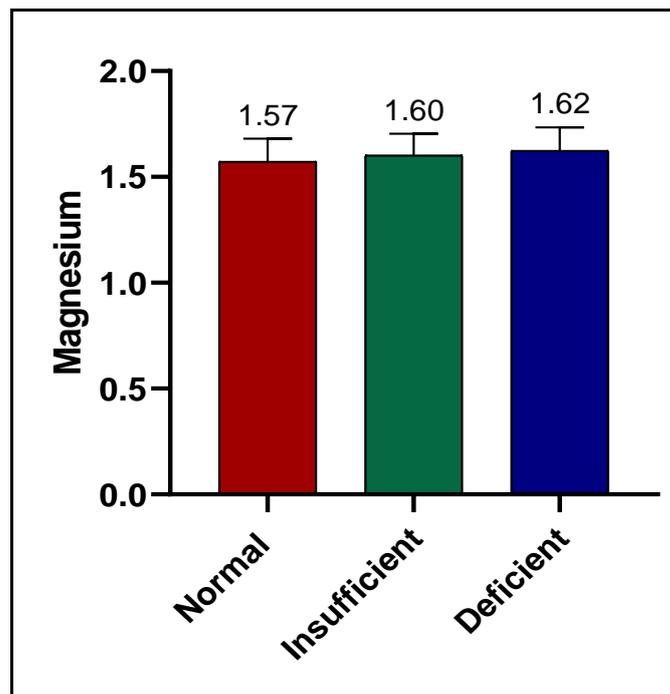


Figure 2: Magnesium Levels.

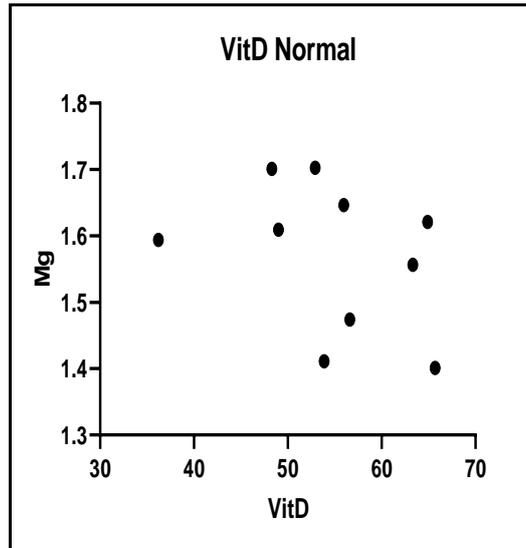


Figure 3: Vitamin D and magnesium correlation analysis in normal group.

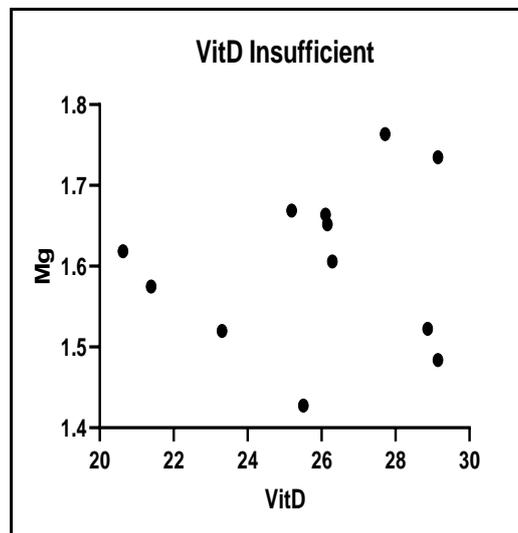


Figure 4: Vitamin D and magnesium correlation analysis in insufficient group.

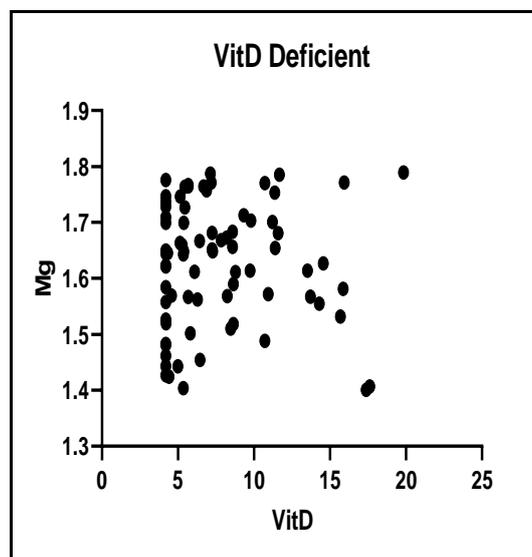


Figure 5: Vitamin D and magnesium correlation analysis in deficient group.

DISCUSSION

In the present study, Vitamin D in normal group was 54.68 ± 8.965 , in insufficient group was 25.79 ± 2.842 and in deficient group was 7.704 ± 3.909 . Magnesium in normal group was 1.572 ± 0.1098 , in insufficient group was 1.603 ± 0.1014 and in deficient group was 1.625 ± 0.1092 . Correlation analysis of Vitamin D and magnesium revealed a negative correlation in normal group ($r = -0.3561$), and a positive correlation in insufficient group ($r = 0.1277$) and deficient group ($r = 0.01423$). In the study conducted by Rai et al., Vitamin D total, calcium, and magnesium levels were 20.32 ± 6.84 ng/mL, 9.6 ± 0.52 mg/dL, and 2.24 ± 0.22 mg/dL, respectively, in the overall study population. The mean blood magnesium level in the vitamin D deficient and insufficient patients was 2.24 ± 0.22 mg/dL, which was not statistically significantly different from the mean Mg level (2.22 ± 0.18 mg/dL) in vitamin D sufficient cases.

Serum magnesium levels in the Bahinipati and Mohapatra research reduced dramatically when vitamin D levels dropped.¹¹ The levels of serum magnesium and vitamin D had a significant positive correlation. In a large nationally representative population, Kelishadi R et al. discovered a strong connection between Mg and Vit D using linear regression analysis.¹² Uwitonze AM et al. analyse the intake of Mg with or without Vit D can improve vitamin D status.¹ Similarly, Vojtkova et al. showed that children with type 1 diabetes who had low vitamin D levels have lower serum magnesium levels.¹³

The complex interactions of the gut, bone, and kidney maintain magnesium homeostasis. Magnesium is a necessary component for vitamin D production and activation, which can lead to an increase in intestinal magnesium absorption and a feed-forward loop that keeps the body in a state of equilibrium. Dysregulation in any of these nutrients has been linked to skeletal abnormalities, cardiovascular disease, and metabolic syndrome, among other things. The promotion of the body's intrinsic capacity to heal itself is a key premise of osteopathic treatment. A deeper knowledge of how magnesium supplements might aid patients with vitamin D deficient problems would be beneficial to patient treatment.

CONCLUSION

Based on serum magnesium levels, the research can assess the need for mediational cost and unfavourable side effects associated with multitherapy with vitamin D and magnesium, as per current clinical practise. It also emphasized the need of monitoring magnesium levels in the body rather than in the blood. According to our findings, Mg and Vit D supplementation is not recommended to treat hypovitaminosis D based on Mg levels since vitamin D and blood magnesium levels are not dependent on one another. Magnesium supplements may help to alleviate the effects of vitamin D deficiency by aiding in the impregnation of the immune system.

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