

Assessment of Serum Vitamin D and Serum Magnesium: An Observational StudySaurabh Kumar Deo¹, Rajesh Kumar², Vijay Chaudhary³, Neeru Bhaskar⁴, B. L. Bhardwaj⁵¹Associate Professor, Department of Biochemistry, Adesh Medical College & Hospital, Mohri, Shahabad (M), Haryana, India²Assistant Professor, Department of Biochemistry, Adesh Medical College & Hospital, Mohri, Shahabad (M), Haryana, India³Associate Professor, Department of Biochemistry, MM Medical College and Hospital, Laddo, Sultanpur Road, Kumarhatti, Solan, HP⁴Professor & Head, Department of Biochemistry, Adesh Medical College & Hospital, Mohri, Shahabad (M), Haryana, India⁵Professor, Department of Medicine, Adesh Medical College & Hospital, Mohri, Shahabad (M), Haryana, India

Received: 25-04-2025 / Revised: 23-05-2025 / Accepted: 26-06-2025

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Conflict of interest: Nil

Abstract:

Introduction: Sunshine Vitamin D, biologically active as 25(OH)₂D, is important for calcium absorption and maintains normal bone health. Other functions like cell growth, neuromuscular and immune function, and reduction of inflammation require the nutrient. Magnesium, the fourth most abundant mineral, activates hundreds of enzymes that are involved in important biological reactions. Without magnesium, vitamin D is not really useful. Recommended amount of magnesium is consumed to obtain the optimal benefits of vitamin D. Mg is required as cofactor for CYP2R1 and CYP24A1 enzymes important for vitamin D metabolism.

Aim: To estimate serum magnesium and serum vitamin D levels.

Materials and Methods: The study was conducted among 120 subjects of either sex and independent of age. Serum vitamin D [25(OH)D] and serum Magnesium were estimated using Fluorimetric Enzyme Immunoassay method and Xylidyl blue method respectively and the results obtained were statistically analyzed for drawing best possible outcome.

Result: The mean age of the participants was 53.54±21.91 years. The participants had serum vitamin D level of 25.19±15.57 ng/ml and serum magnesium level of 2.07±1.13 mg/dl. Nearly 74% participants are hypovitaminosis D. About 53% male and 63% female are hypovitaminosis D. Subjects having low vitamin D also have lower serum magnesium.

Conclusion: The data indicates only a little effect between vitamin D and serum Mg with high prevalence of vitamin D deficiency and insufficiency.

Keywords: Vitamin D, Magnesium, Liver Disease, Chronic, Deficiency.

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Introduction

Sunshine Vitamin D, biologically active as 25(OH)₂D, is important for calcium absorption and maintains normal bone health. [1] Other functions like cell growth, neuromuscular and immune function, and reduction of inflammation require the nutrient. Vitamin D has its function at molecular level like genes responsible for translating the proteins responsible for regulating apoptosis, cell proliferation and differentiation. [1] Magnesium, the fourth most abundant mineral, acts as a cofactor for many biologically important enzymes are involved in various metabolic processes, for example role of magnesium in metabolism of vitamin D. [2] Analy-

sis of serum vitamin D and serum magnesium (Mg) has become one of the significant topics for human health and disease as these vital nutrients have been established as diagnostic and therapeutic values. Adults, now a days, have lower levels of vitamin D and magnesium in their body but are still ignored. Razaque et al, stated "Without magnesium, vitamin D is not really useful". Nutrients don't work alone, therefore, both the vital nutrients should be taken together in recommended dose since vitamin D (if taken alone in high dose) can lead to misinterpretation vitamin D side effects, although magnesium deficiency symptoms may be evident. [2,3]

Reddy et al (2019) suggested that magnesium supplementation (in recommended amount) must be considered as an important for vitamin D as therapeutic nutrient. [1] Similarly, Uwitonze et al (2018) [4] also suggested that magnesium should be supplemented in appropriate dose to benefit most of vitamin D role for normal health. Keeping in view the facts, this study was designed to assess magnesium and vitamin D status in body of the people visiting the hospital.

Aim: To estimate serum magnesium and serum vitamin D levels amongst subjects attending OPD of Adesh Medical College and Hospital, Mohri, Shahbad (M).

Materials and Methods: The study was conducted in the Department of Biochemistry of Adesh Medical College and Hospital, Mohri, Shahbad (M), Haryana.

Inclusion Criteria: 120 subjects of either sex and independent of age were included in the study

Exclusion Criteria:

1. Pregnant and lactating women.
2. Vitamin D and/or calcium taking individuals.
3. Antiepileptic or any other drugs that affect metabolism of bone tissues.
4. Known cases of skeletal ailments and PTH disorders.
5. Diseases affecting renal functions or liver functions.
6. HIV+ cases.

Circulating 25(OH)D level was analysed by the technique based Fluorimetric Enzyme Immunoassay. [5] Serum Magnesium was estimated by Xylydyl blue method. [6]

The results were statistically analyzed for possible outcome.

Result and Discussion

120 subjects attending OPD of the Hospital of Adesh Medical College and Hospital, Mohri, Sahabad, Haryana, participated in this study. The following are biochemical parameters analyzed and results obtained (Table 1).

Table 1: Biochemical Parameters of the Participants

SN	Variables	Minimum - Maximum	Mean \pm SD	Reference
1	Age (Yrs.)	1 - 90	53.54 \pm 21.91	---
2	Serum Vitamin D (ng/ml)	4.9 - 73.1	25.19 \pm 15.57	Deficiency: < 20 ng/ml Insufficiency: 20-30 ng/ml Sufficiency: 30 - 100 ng/ml
3	Serum Magnesium (mg/dl)	1.1 - 4.1	2.07 \pm 1.13	1.5-2.5 mg/dl

The mean age of the participants was 53.54 \pm 21.91 years. The participants had serum vitamin D level of 25.19 \pm 15.57 ng/ml and serum magnesium level of 2.07 \pm 1.13 mg/dl (Table 1). The participants showed insufficient vitamin D. The lowest level of vitamin D and magnesium being 4.9 ng/ml (greatly deficient) and 1.1 mg/dl respectively while the highest level among the participants was 73.1 ng/ml of vitamin D and 4.1 mg/dl of serum magnesium. Several research are proof of lower vitamin D and magnesium values among the individuals around the globe and in Indian as well. [7-10] The mean age of male subjects was 52.52 years and

females were 54.56 years. The age difference was statistically insignificant. Serum vitamin D and serum magnesium levels were lower among male subjects compared to female subjects (Table 02.) although the difference was statistically insignificant. Studies carried by Sanghera et al (2018) [11] and Murali et al (2020) [12] and Shameel et al (2023) [13] have demonstrated lower value of serum vitamin D and serum magnesium among males compared to females. This may be due to females have lesser daily requirement than males and after menopause estrogen level being low might play role. [14]

Table 2: Gender based Biochemical Parameters

SN	Gender	Age (yrs.)	Serum Vitamin D	Serum Magnesium
1	Male (n=60)	52.52 \pm 22.22	24.74 \pm 14.71	2.02 \pm 0.43
2	Female (n=60)	54.56 \pm 21.76	25.64 \pm 16.52	2.13 \pm 1.54
3	Min - Max (Male)	1 - 82	4.9 - 73.1	1.2 - 3.1
4	Min - Max (Female)	1 - 90	5.2 - 68.4	1.1 - 3.5

Among 120 participants, 59 subjects were vitamin D deficient and 29 subjects had insufficient level (Table 3).

Nearly 74% participants are hypovitaminosis D. About 53% male and 63% female are hypovitaminosis D. Subjects having low vitamin D also

have lower serum magnesium and Subjects with Sufficient vitamin D have higher serum magnesium level but the differences are not statistically significant. Now it has been evident from various studies that major population around the globe especially India is having low vitamin D level in blood. [8-10]

Studies have also shown various diseases associated with low level of serum vitamin D.

Table 3: Serum Magnesium Distribution based on Vitamin D Distribution

SN		Deficient (<20 ng/ml)	Insufficient (20–<30 ng/ml)	Sufficient (30–100 ng/ml)	Potential Toxicity (>100 ng/ml)
1	Number of Sample	59	29	32	Nil
2	Serum Magnesium	1.93±0.42	2.00±0.47	2.36±1.97	
3	Male (n)	20	12	28	
4	Female (n)	28	10	22	

About 7% of the participants were having low serum magnesium level. Mg acts as a cofactor for the forming 25(OH)D from vitamin D by an enzyme called 25-hydroxylase (CYP2R1) in hepatic cell and 1 α -hydroxylase (CYP27B1) catalyzes to synthesize 1,25-(OH)₂D (metabolically active) in the kidneys. CYP24A1 (24-hydroxylase) catalyzes the initiation of catabolism of 25(OH)D i.e. formation of 24,25-dihydroxyvitamin D. The action of catabolic enzyme CYP24A1 is determined by the availability of magnesium in the body. Therefore, circulating metabolites of vitamin D may negatively be affected if magnesium in body is depleted and failed to obtain in appropriate amount via food.

Limitations: More numbers of individuals need to participate in this type of research to generalize the research outcome. The actual serum level of magnesium can really define the magnesium pool of our body because magnesium has also its role as intracellular cation. Statistically significant association between serum vitamin D and magnesium levels cannot be established from the study. More research is required to establish the relation if any. [10,15,16]

Diminutive association between blood Mg and vitamin D value in individuals with high incidence of deficiency and insufficiency of vitamin D. However, it is worth mentioning that regular screening of vitamin D and magnesium status should be carried out to avoid unwanted complications especially among the elderly and teen-age population.

Summary

Vitamin D becomes metabolically useful with appropriate availability of magnesium in body. To obtain the optimal benefits of vitamin D magnesium should be taken in diet as per recommended dose. Mg is required (as cofactor) by CYP2R1 and CYP24A1. Nearly 74% participants are hypovitaminosis D. About 53% male and 63% female are hypovitaminosis D.

Subjects having low vitamin D also have lower serum magnesium and Subjects with Sufficient vitamin D have higher serum magnesium level but the differences are not statistically significant. Very thin but not statistically significant association between Mg and vitamin D is demonstrated by our study.

Acknowledgements

The authors acknowledge all the participants directly or indirectly involved and made possible this study.

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