

Original article:

Assessment of Musculoskeletal Pain among Patients with Vitamin D Deficiency

Dr. Devendra Kumar Kundara

Junior Specialist (General Medicine), D.B. Hospital, Churu, Rajasthan, India.

Corresponding Author: Dr. Devendra Kumar Kundara,

ABSTRACT

Background: Hypovitaminosis D is a worldwide health problem. There have been very few studies establishing the relationship between Vitamin D deficiency and muscular pain, and the effect of managing them with substitution with Vitamin D. The present study was conducted to assess vitamin D levels amongst subjects with musculoskeletal pain.

Materials and methods: The present prospective descriptive study was initiated in the General Medicine department, D.B. Hospital, Churu, Rajasthan, India during a period of 1 year. Calorimetry was used for assessment of calcium levels. ELISA reader awareness was used to determine the levels of vitamin D. All the subjects having deficiency of vitamin D were managed with 50000 unit per week of vitamin D3 and 1000mg per day of calcium. They were followed up for a period of 4 months and assessment of pain was done. Student T-test and Mann whitney were used for the analysis of data. Probability value of less than 0.05 was considered significant.

Results: The mean age of the study subjects was 35.6 ± 10.4 . The mean calcium level was 9.5 ± 0.5 mg/dl. The mean parathyroid level was 46.2 ± 40.1 Pmol/L. The mean Vitamin D level was 21.6 ± 10.2 nmol/l. There were 78.3% responders and 60% non-responders with Vitamin D level more than 25nmol/L. The mean Vitamin D level after treatment amongst the responders and non-responders was 61.6 ± 28.6 and 38.2 ± 9.5 respectively.

Conclusion: In our study also significant difference in the level of Vitamin D was seen amongst the responders and the non responders.

INTRODUCTION

In general practice muscle pain and headache are commonly encountered symptoms and they are of varying etiologies. Hypovitaminosis D is a worldwide health problem. There have been very few studies establishing the relationship between Vitamin D deficiency and muscular pain, and the effect of managing them with substitution with Vitamin D.^[1-3] Around 80-90% of the Vitamin D supply to humans is by ultraviolet B sunlight exposure and rest of it is by the food containing vitamin D.⁴⁻⁶ The amount of Vitamin D absorption varies with age, skin color,

season and latitude. It has been seen that elderly and dark skinned people need 2 to 10 times more exposure than fair skinned people for same amount of Vitamin D synthesis.^{6,7} People who always keep their bodies covered, staying indoors and having a low intake of cod liver oil are prone to hypovitaminosis D.^{6,8} Activated Vitamin D binds to various Vitamin D receptors present in our body and regulate differentiation of cells.^{4,5,9,10} In the year 2001, it was found out that vitamin D receptors were also present on muscle cells indicating its role in musculoskeletal function.¹¹ Studies have shown that correcting

hypovitaminosis D decreased postural problems and the incidence of falls and fractures amongst elderly subjects.¹²The optimal amount of vitamin D required by body is 75–150 nmol/L and the level of oral vitamin D required for maintaining a health defensive effect remains debatable.^{6,10} The present study was conducted to assess vitamin D levels amongst subjects with musculoskeletal pain.

MATERIALS AND METHODS

The present prospective descriptive study was initiated in the General Medicine department, D.B. Hospital, Churu, Rajasthan, India. The study included a total of 70 subjects reporting to the department who were more than 18 years of age. Subjects younger than 18 years of age were not included in the study. All the subjects were made to discontinue their multivitamin or calcium supplementation for a period of 2 weeks. Subjects with renal, liver, malabsorption disorders were excluded from the study. Patients of disk disorders, rheumatological diseases were also excluded from the study. Under complete aseptic conditions blood samples were obtained and assessed for Vitamin D, parathyroid, calcium and phosphate concentrations. Calorimetry was used for assessment of calcium levels. ELISA reader awareness was used to determine the levels of vitamin D. All the subjects having deficiency of vitamin D were managed with 50000 unit per week of vitamin D3 and 1000mg per day of calcium. They were followed up for a period of 4 months and assessment of pain was done. Pain before and after treatment was assessed using visual analogue scale. Levels of Vitamin D, calcium and phosphate were compared between the responders and the non responders. All the data was arranged in a tabulated form and analysed using SPSS software. Student T-test and Mann whitney were used for the

analysis of data. Probability value of less than 0.05 was considered significant.

RESULTS

The present study enrolled 70 subjects, out of which majority were males.

Table 1 shows the demographic characteristics of the subjects. The mean age of the study subjects was 35.6 ± 10.4 . The mean calcium level was 9.5 ± 0.5 mg/dl. The mean parathyroid level was 46.2 ± 40.1

Pmol/L. The mean Vitamin D level was 21.6 ± 10.2 nmol/l. There were 75.7% subjects with Vit D level more than 25nmol/l and in 22.8 % subjects it was less than 12nmol/L.

Table 2 shows the comparison between variables amongst the responders and non-responders. There were 60 who responded to the therapy. The mean age amongst the responders and non-responders was 36.5 ± 12.4 and 36.4 ± 13.1 respectively. The mean calcium level amongst responders and non-responders was 9.0 ± 0.2 and 9.1 ± 0.4 respectively. There were 78.3% responders and 60% non-responders with Vitamin D level more than 25nmol/L. The mean Vitamin D level after treatment amongst the responders and non-responders was 61.6 ± 28.6 and 38.2 ± 9.5 respectively.

DISCUSSION

Vitamin D also has anti-inflammatory action by regulating level of interleukin, tumor necrosis factor, and macrophage activity.⁹ Thus, Vitamin D supplements have an effect on inflammatory component of pain. Management with vitamin D has been useful in reducing pain amongst diabetic polyneuropathies patients.¹³There is lack of data to support this evidence of advantage of Vitamin D in musculoskeletal pain subjects.¹⁴As per our study, the mean age of the study subjects was 35.6 ± 10.4 . The mean calcium level was 9.5 ± 0.5 mg/dl. The mean

parathyroid level was 46.2 ± 40.1 Pmol/L. The mean Vitamin D level was 21.6 ± 10.2 nmol/l. There were 75.7% subjects with Vit D level more than 25nmol/l and in 22.8 % subjects it was less than 12nmol/L. In a study conducted amongst Arab and Indo-Pakistani subjects with hypovitaminosis D, it was decreased in 90% of the subjects after supplementation with Vitamin D.² According to a survey in UK, pain amongst 3297 women was ominously associated with vitamin D levels. However, this was not seen in case of men.¹ According to a Danish study amongst Arab women with reduced level of vit D had lesser muscle power in proximal lower limb compared to the controls. On management of the cases with vit D, the muscle power was normalized.¹⁵ In our study, there were 60 who responded to the therapy. The mean age amongst the responders and non-responders was 36.5 ± 12.4 and 36.4 ± 13.1 respectively. The mean calcium level amongst responders and non-responders was 9.0 ± 0.2 and 9.1 ± 0.4 respectively. There were 78.3% responders and 60% non-

responders with Vitamin D level more than 25nmol/L. The mean Vitamin D level after treatment amongst the responders and non-responders was 61.6 ± 28.6 and 38.2 ± 9.5 respectively. Various recent surveys have shown an increased survival rates amongst cancer subjects diagnosed in the winter when vitamin D level are high.^{15,16} Vitamin D is known to inhibit proliferation of tumor promoting differentiation and apoptosis in various cell lines.¹⁶ Various other health issues like cardiovascular disorders, diabetes, and autoimmune disorders, have been recently associated with vitamin D deficiency.^{4-6,9}

CONCLUSION

There are many advantages of Vitamin D supplementation. Evidences indicate that various immune mediated, musculoskeletal disorders can be managed by Vitamin D supplementation. In our study also significant difference in the level of Vitamin D was seen amongst the responders and the non responders.

REFERENCES

1. Atherton K, Berry DJ, Parsons T, Macfarlane GJ, Power C, Hypponen E. Vitamin D and chronic widespread pain in a white middle-aged British population: Evidence from a cross-sectional population survey. *Ann Rheum Dis.* 2009;68:817–22.
2. Badsha H, Daher M, Ooi KK. Myalgias or non-specific muscle pain in Arab or Indo-Pakistani patients may indicate vitamin D deficiency. *Clin Rheumatol.* 2009;28:971–3.
3. Plotnikoff GA, Quigley JM. Prevalence of severe hypovitaminosis D in patients with persistent, nonspecific musculoskeletal pain. *Mayo Clin Proc.* 2003;78:1463–70.
4. Norman AW. From vitamin D to hormone D: Fundamentals of the vitamin D endocrine system essential for good health. *Am J Clin Nutr.* 2008;88:491S–9S.
5. Moan J, Porojnicu AC. The photobiology of vitamin D – a topic of renewed focus. *Tidsskr NorLaegeforen.* 2006;126:1048–52.
6. Pearce SH, Cheetham TD. Diagnosis and management of vitamin D deficiency. *BMJ.* 2010;340:142–7.

7. Meyer H, Brunvand L, Brustad M, Holvik K, Johansson L, Paulsen JE. Nasjonaltråd for ernæring. Oslo: Norwegian Nutrition Council; 2006. Tiltak for å sikre en god vitamin D-status i befolkningen [proposals to secure a good vitamin D-status in the population]. Rapport IS-1408.
8. Holvik K, Brunvand L, Brustad M, Meyer HE. Vitamin D status in the Norwegian population. Solar Radiation and Human Health, Norwegian Academy of Science and Letters. 2008;216–28.
9. Holick MF. Vitamin D deficiency. N Engl J Med. 2007;357:266–81.
10. Holick MF. Resurrection of vitamin D deficiency and rickets. J Clin Invest. 2006;116:2062–72.
11. Bischoff HA, Borchers M, Gudat F, Duermueller U, Theiler R, Stahelin HB, et al. In situ detection of 1,25-dihydroxyvitamin D3 receptor in human skeletal muscle tissue. Histochem J. 2001;33:19–24.
12. Bischoff-Ferrari HA, Woson-Hughes B, Staehelin HB, Orav JE, Stuck AE, Theiler R, et al. Fall prevention with supplemental and active forms of vitamin D: A meta-analysis of randomised controlled trials. BMJ. 2009;339:843–6.
13. Lee P, Chen R. Vitamin D as an analgesic for patients with type 2 diabetes and neuropathic pain. Arch Intern Med. 2008;168:771–2.
14. Straube S, Moore RA, Derry S, McQuay HJ. Vitamin D and chronic pain. Pain. 2009;141:10–13.
15. Moan J, Porojnicu A, Lagunova Z, Berg JP, Dahlback A. Colon cancer: Prognosis for different latitudes, age groups and seasons in Norway. J Photochem Photobiol B. 2007;89:148–55.
16. Porojnicu AC, Robsbahm TE, Dahlback A, Berg JP, Chrisitani D, Bruland OS, et al. Seasonal and geographical variations in lung cancer prognosis in Norway: Does vitamin D from the sun play a role? Lung Cancer. 2007;55:263–270.

Table 1: characteristics of the subjects at the initiation of the study.

Variable	Value
Age (years)	35.6 ± 10.4
Calcium (mg/dl)	9.5 ± 0.5
PTH (pmol/l)	46.2 ± 40.1
Vit D (nmol/l)	21.6 ± 10.2
Vit D < 25 nmol/l	53 (75.7%)
Vit D < 12 nmol/l	16 (22.8%)

Table 2: Comparison between the responders and the non responder

Variable	Responders	Non responders	P value
Age (years)	36.5±12.4	36.4±13.1	>0.05
Calcium (mg/dl)	9.0± 0.2	9.1± 0.4	>0.05
PTH (pmol/l)	48.7±42.6	34.3±29.7	>0.05
Vit D (nmol/l)	21.7±10.1	21.8±10.3	>0.05
VitD >25 nmol/l	47 (78.3%)	6 (60%)	>0.05
Vit D< 12 nmol/l	13 (21.7%)	4 (40%)	>0.05
Vit D after treatment	61.6±28.6	38.2±9.5	<0.05
Change in Vit D	41.3±29.1	15.4±11.0	<0.05