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Original Research Paper

Vitamin D Deficiency in Adolescents Presenting with Musculoskeletal Pain: A Prospective Study

Medical Science

KEYWORDS : vitamin D, musculoskeletal pain, adolescent

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ABSTRACT

Vitamin D is essential for maintaining calcium and phosphorus homeostasis, and optimizing bone health. The active form of vitamin D 1,25-dihydroxyvitamin D (1,25 [OH]2D) acts on specific nuclear receptors to increase calcium absorption from the small intestine and regulate bone turn over. Muscle weakness is also a prominent feature of vitamin D deficiency. Patients with nonspecific muscle weakness, muscle aches and pains have also been found with vitamin D inadequacy. Studies show conflicting results in the treatment of musculoskeletal pain with vitamin D. A cross-sectional study was conducted to assess the vitamin D deficiency in adolescents presenting with non-specific musculoskeletal pain at the out-patient department of Physical Medicine and Rehabilitation, RIMS, Imphal, India. 72 patients in the age group 10 to 18 year presenting with non-specific musculoskeletal pain were included in the study. 25-hydroxyvitamin D (25-OHD) level was measured by chemiluminescence competitive immunoassay. Visual Analoque Scale (VAS) was used for quantification of musculoskeletal pain. Out of the 72 patients, 59%(42) of the patients had deficiency of 25-OHD, 33%(24) had insufficiency. The improvement in pain with oral vitamin D was found to be significant ($p<0.05$). There was no correlation between the serum 25-hydroxyvitamin D (25-OHD) level and VAS score ($p>0.05$). The study concluded that vitamin D deficiency in adolescents with non-specific musculoskeletal pain is common and the pain is not entirely due to Vit D deficiency and is likely affected by other factors such as abnormalities in molecular pathophysiology.

Introduction:

Vitamin D is currently of great public health interest, because vitamin D deficiency is common and is causally associated with musculoskeletal diseases.Vitamin D is mainly derived from endogenous ultraviolet-B induced vitamin D synthesis in the skin, and the current high prevalence of vitamin D deficiency can, therefore, largely be attributed to lifestyle related low sunlight exposure.[1]

Vitamin D is essential for maintaining calcium and phosphorus homeostasis, and optimizing bone health. The active form of vitamin D 1,25-dihydroxyvitamin D (1,25 $[OH]_2D$), acts on specific nuclear receptors to increase calcium absorption from the small intestine and regulate bone turn over. Muscle weakness is also a prominent feature of vitamin D deficiency. Patients with nonspecific muscle weakness, muscle aches and pains have also been found with vitamin D inadequacy. It has been established that skeletal muscle tissue contains vitamin D receptor and may require vitamin D to realize maximum function. Additionally, $1,25(OH)_2$ D binds to receptors on skeletal muscles.[2]

In addition, there has been an increasing interest over the last few years in the relationship of vitamin D with extraskeletal diseases.[3] This increased interest was caused by the identification of vitamin D receptors (VDRs) in almost all human cells. Several epidemiological studies have shown associations of vitamin D deficiency with a variety of chronic extraskeletal diseases, including cardiovascular and renal diseases, cancer, autoimmune, neurological and infectious diseases.[1]

Wide range of evidences from genetic, nutritional and epidemiological studies link vitamin D endocrine system with diseases like hypertension, myopathic disorders, proneness to infection, autoimmune disorders and cancer.

Jan et al[4] have reported an association between vitamin D deficiency and fibromyalgia (FM) and vitamin D replacement may have a therapeutic role in management of FM symptoms.

Many studies have been published relating the association of vitamin D deficiency and different musculoskeletal (MSK) pain with controversial conclusions.

According to Institute of Medicine serum vitamin D is said to be deficient when serum level is <25nmol/l, insufficient (25-50 nmol/l), optimal (>50 nmol/l), toxicity (>150 nmol/l).

Methods:

After obtaining approval from the Institutional Ethics Committee, Regional Institute of Medical Sciences, Imphal, India, 72 adolescents presenting with non-specific musculoskeletal pain without evidence of injury, disease, or neurological or anatomical defect were enrolled into this prospective study. Consent was obtained from all subjects who participated in the study. The period of study was from

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July 2014 to November 2015. Inclusion criteria were as follows: (1) Non-specific musculoskeletal pain, (2) Age 10-18 years, (3) duration of symptom >4 weeks. Patients were excluded if they have (1) history of antecedent trauma, (2) infection, (3) tumour, (4) endocrine (5) renal and liver diseases, (6) neurological and bone diseases, and (7) drugs which may cause muscle pain.

A thorough clinical examination was performed to rule out any known cause of musculoskeletal pain. Routine baseline investigations and x-rays, if needed were done. Visual Analoque Scale (VAS) was used for quantification of musculoskeletal pain. 25-hydroxyvitamin D_3 (25-OHD) level was measured by chemiluminescence competitive immunoassay at baseline and after 8 weeks. Other laboratory investigations like, parathyroid hormone (PTH), serum calcium, serum phosphorus were also measured.

Patients received 60,000 IU of water soluble form of vitamin D weekly for 8 weeks. Follow up examination was done after 8 weeks. Tablet Paracetamol was given as rescue drug depending on the weight of the patient.

Statistical analysis
Data analysis was done using Statistical Package for Social Sciences (SPSS) version 21. Descriptive analysis including mean, percentage were used. Paired t- test, Wilcoxon Signed Ranks Test were used for significant test. Value of $p < 0.05$ was considered to be statistically significant.

Results
Patients' range of age were 10-18 year (Mean age=13.68±3.72) [Table 1]. There were more females than males (47:25). Out of the 72 patients, 59%(42) of the patients had deficiency of 25-OHD, 33%(24) had insufficiency [Table 2].

	Categories	Number of patients	Percentage (%)
Age (years)	10-14	34	47.2
	15-18	38	52.8
Sex	Male	25	34.7
	Female	47	65.3
Religion	Hindu	63	87.5
	Christian	6	8.3
	Muslim	3	4.2

Table 1: Baseline characteristics

Serum Vit D	Number of patients	Percentage %
Deficient (<25 nmol/l)	42	59
Insufficient (25-50 nmol/l)	24	33
Sufficient (>50 nmol/l)	6	8

Table 2: Serum vitamin D level

	Pre-treatment	Post-treatment	t	z	P-value
Vit-D	18.38±8.8	29.50±7.50	9.92*		0.001
VAS	4.9±1.02	2.12±1.14		-6.793#	0.000

Table 3. Improvement in serum vit D and VAS *****
Paired t test
 # Wilcoxon Signed Ranks Test

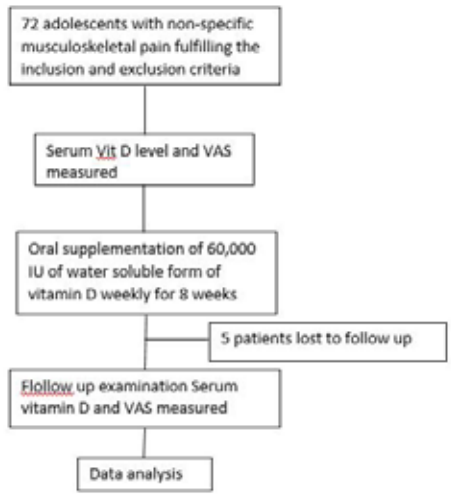

Figure 1: Study algorithm

Intensity of pain was significantly reduced following treatment with vitamin D3. The reduction of VAS score from baseline to eight weeks following treatment was 4.9±1.02 to 2.12±1.14 (p value=0.000) corresponding to improvement in serum vitamin D3 level from 18.38±8.8 to 29.50±7.50 nmol/l (p value=0.001)[Table 3]. The relationship between vitamin D status and pain intensity score (VAS) was found to be insignificant (pearson co-efficient= 0.082, p value= 0.495).

Five patients lost to follow up.

Discussion
Musculoskeletal pain is a common problem encountered in the daily practice of the general practitioner, internists, rheumatologists and physiatrists. Vitamin D deficiency among adolescents presenting with non-specific musculoskeletal pain is common.

Le Goaziou MF et al[5] also found similar result that the correction of vitamin D deficiency in patients with chronic musculoskeletal pain resulted in a significant decrease in the level of pain intensity according to verbal rating scale and the Digital Scale, consumption of analgesics and discomfort in carrying out activities of daily living following: the shopping, cleaning, walking for more than a kilometer and dressing.

However Warner et al[6] found a conflicting result that Low vitamin D levels are not associated with diffuse musculoskeletal pain, and treatment with vitamin D does not reduce pain in patients with diffuse pain who have low vitamin D levels.

A total daily vitamin D supplementation of 2300 to 2800 IU, to start, would be potentially beneficial for patients which chronic musculoskeletal pain and fatigue syndromes. It is worth stressing the report that it may take up to nine months for the maximum effects of such supplementation to be reached.[7]

The study shows that there is improvement in mean serum vit D and VAS following supplementation with vitamin D which was found to be significant. Serum 25(OH)D levels were not significantly correlated with the VAS score.

Conclusion
The findings suggest that musculoskeletal pain is not entirely due to Vit D deficiency and is likely affected by other

factors such as abnormalities in molecular pathophysiology. Our findings suggest that it is unlikely that measuring vitamin D will be of diagnostic value in the routine assessment of regional and generalized MSK pain. It is not clear whether vitamin D is cause-effect or simply an epiphenomenon in painful situations. Hence, further study into the molecular pathophysiology of non-specific musculoskeletal pain is warranted.

References

1. Kienreich, K., Grubler, M., Tomaschitz, A., Schmid, J., Verheyen, N., Rutters, F., Dekker, J.M., & Pilz, S. (2013). Vitamin D, arterial hypertension & cerebrovascular disease.*The Indian journal of medical research, 137(4)*, 669-679.
2. Shinchuk,L., M., Morse,L., Huancahuari, N., Arum, S., Chen, T. C., & Hollick, M, F. (2006). Vitamin D Deficiency and Osteoporosis in Rehabilitation Inpatients.*Archives of Physical Medicine and Rehabilitation, 87(7),* 904-908.
3. Holick, M.F. (2007).Vitamin D deficiency. *The New England journal of medicine*, *357,* 266-281.
4. Jan, A. K., Bhatt, A. I., Stafford, C., Carolan, M., & Ramakrishnan, S. A. (2012). Serum 25-hydroxy vitamin D levels in patients with fibromyalgia. *Rheumatology*, *51,* 139.
5. Le Goaziou, M. F., Bodier, E., Souweine, G., Moreau, A., Perdrix, C., Flori, M., &Dupraz, C. (2012).Musculoskeletal chronic pains and Vitamin D deficiency. Study before after in general practice. *Pressemédicale, 42(4),* 10613. doi:10.1016/j.lpm.2012.09.021
6. Warner, Ann, E., Arnspiger, & Sarah, A. (2008). Diffuse Musculoskeletal Pain Is Not Associated With Low Vitamin D Levels or Improved by Treatment With Vitamin D. *Journal of cancer research*, *14(1),* 1216.
7. Leavitt, S. B. (2008). Vitamin D – a neglected 'Analgesic' for chronic musculoskeletal pain; editorial an evidence-based Review & Clinical Practice Guidance.*Pain Treatment Topics*, *6(1),* 2-50.