

Role of vitamin D3 in cases of children having Idiopathic musculoskeletal pain

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Abstract

Background: Vitamin D has an important role to play in bone and muscle metabolism. Some studies have evaluated the role of vitamin D in musculoskeletal pain and a few have reported resolution of musculo-skeletal pain and improvements in associated physical functioning following vitamin D supplementation. The present study was planned with the primary objective to study the vitamin D levels in children with IMSP and to compare it with that of healthy controls and with secondary objectives of comparing the serum calcium, phosphorous and alkaline phosphates levels in these children. **Methods:** It was observational cross sectional hospital based study, and conducted in IPD and OPD of Pediatric Medicine, Midnapore Medical College, West Bengal, during the study period, January 2019 to November 2019. In the absence of previous studies in Indian children on vitamin D levels in children with IMSP compared to controls, we conducted a pilot study on eight children with IMSP and eight controls. The calculated sample size required for the two groups was 30 each. Thus it was decided to include 30 children each as cases and controls. **Results:** We found a relatively high prevalence of vitamin D deficiency in controls (26 %) also, the difference in mean value of vitamin D as compared to the cases was statistically significant ($P < 0.001$). In this study greater number of children with IMSP had moderate vitamin D deficiency as compared to controls (43 %/0%), and this was reflected most prominently in age group of 6-9 years with IMSP. **Conclusion:** Vitamin D might have some role in IMSP and therefore assessment of Vitamin D in all the children with IMSP might be beneficial

Key Word: Vitamin D, musculo-skeletal pain, IMSP.

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INTRODUCTION

Idiopathic musculoskeletal pain (IMSP) is a chronic pain condition involving musculoskeletal parts of the body with no obvious cause¹. Various studies on IMSP have included variable pain duration (from 6 week-3 months) to define these cases.²⁻⁴ and the terms non-specific and idiopathic MSP have been used interchangeably^{3,4}. Studies have reported loss of schooling, social disruption,

psychosomatic problems and poor quality of the life in these children.⁴ The reported risk factors for IMSP include physical hyper mobility, female gender, psychological factors and deficiency of vitamin D.⁵⁻⁸ Pain is a ubiquitous experience and musculoskeletal pain in children is common.²⁸ Acute musculoskeletal pain is frequent and the cause of the pain is usually obvious. Chronic pain often proves to be a difficult diagnostic and therapeutic challenge and, by definition, there are no obvious or overt noxious stimuli in children with idiopathic musculoskeletal pain to explain the pain. The risk factors for idiopathic musculoskeletal pain reported are female gender, physical hyper mobility, psychological, deficiency of vitamin D especially in older age group.⁵⁻⁸ Vitamin D has a very important role in bone and muscle metabolism; hence its deficiency leads to defective mineralization of the bone matrix laid down by osteoblasts. Few studies have evaluated the role of vitamin D in musculoskeletal pain. Some reported resolution of musculoskeletal pain and associated improvements in physical functioning

following Vitamin D supplementation whereas others have reported contradictory results.^{9,10} The results of previous studies regarding the levels of vitamin D in serum in cases of idiopathic musculoskeletal pain had been contradictory.

METHODS

Study Setting: In-patients and Out-patients department (OPD) of Pediatric Medicine, Midnapore Medical College, West Bengal. **Timeline:** (January 2019 to November 2019)

Def. of Problem: Idiopathic musculoskeletal pain is defined as musculoskeletal pain in any appendicular or axial body part for a period of at least six weeks and for which no obvious cause could be found.

Def. of population: Study population comprised of patients who will be admitted in Pediatric Medicine department of Midnapore Medical College, and Hospital with IMSP from the emergency and Pediatric Medicine OPD.

Study variables: vitamin D levels in blood, clinical examination

Study design: Observational cross-sectional hospital-based study.

Study type: Interventional.

Allocation: Non-Randomized.

Endpoint Classification -vitamin D levels in IMSP

Primary Purpose- to establish role of vitamin D in IMSP in children

Sample size calculation:

In the absence of previous studies in Indian children on vitamin D levels in children with IMSP compared to controls, we conducted a pilot study on eight children with IMSP and eight controls. The calculated sample size required for the two groups was 30 each. Thus it was decided to include 30 children each as cases and controls.

Sample design: After getting informed consent for participation from the patient party the patient's will be included in the study according to following criteria:

Inclusion criteria:

1. Age 3 years – 12 years.
2. Idiopathic musculoskeletal pain

Exclusion criteria:

1. Those with known causes of musculoskeletal pain like JIA, RA, trauma, growing pains, hypermobility, myositis, fibromyalgia, reflex sympathetic dystrophy etc.
2. Those with clinical evidence of chronic systemic disease like tuberculosis, heart disease, kidney disease, malabsorption etc;
3. Those who had taken vitamin D and calcium supplements, steroids or anticonvulsants in the last 3 months will be excluded from the study.

Sample size: 30 children in the age group 3 to 12 years with idiopathic musculoskeletal pain

Control: equal number of age and sex matched apparently healthy children with no complaints of musculoskeletal pain were included as controls.

Methods of Data Collection: By oral questionnaire method regarding relevant history from patient or patient party, using beside clinical instrument and sending routine investigation to the laboratory and plotting them all them in proforma for case Records. The following details will be recorded from all patients in both groups: name, age, sex, height, weight, body mass index (BMI), history with respect to the type of diet, daily calcium intake and exposure to sunlight. Information with regard to characteristics of idiopathic musculoskeletal pain (duration, location, frequency), disability associated with idiopathic musculoskeletal pain and presence of aggravating factors and associated headache, abdominal pain will be obtained in children with idiopathic musculoskeletal pain.

Statistical analysis:

Statistical Analysis was performed with help of Epi Info (TM) 3.5.3. EPI INFO is a trademark of the Centers for Disease Control and Prevention. χ^2 test was used to test the association of different study variables. t-test was used to compare the means. Significance level was set at 0.05.

RESULTS

Table 1: Age Distribution

Age (yrs)	Frequency	Percent
4 to 6	9	30.0%
6.1 to 9	15	50.0%
9.1 to 12	6	20.0%
Total	30	100.0%

Table 2: Sex Distribution among cases and control group

Sex	Case	Control	TOTAL
Female	14	14	28
Row %	50.0	50.0	100.0
Col %	46.7	46.7	46.7
Male	16	16	32
Row %	50.0	50.0	100.0
Col %	53.3	53.3	53.3
TOTAL	30	30	60
Row %	50.0	50.0	100.0
Col %	100.0	100.0	100.0

Table 3: Mean Vitamin- D in case and control group

	Min	Max	Mean	SD	p-value
Vit-D Case	16.2000	82.7000	37.9333	22.9014	<0.001
Control	45.0000	105.0000	79.0900	16.9771	

Table 4: Level of Vitamin- D in case and control

VitD1	Case	Control	TOTAL
<25(Moderate)	13	0	13
Row %	100.0	0.0	100.0
Col %	43.3	0.0	21.7
25.1-50(Mild)	8	2	10
Row %	80.0	20.0	100.0
Col %	26.7	6.7	16.7
50.1-75	4	6	10
(Insufficient)	40.0	60.0	100.0
Row %	13.3	20.0	16.7
Col %			
>75 (Normal)	5	22	27
Row %	18.5	81.5	100.0
Col %	16.7	73.3	45.0
TOTAL	30	30	60
Row %	50.0	50.0	100.0
Col %	100.0	100.0	100.0

This correlation was statistically significant ($p < 0.001$).

Table 5: Distribution of Joint involvement in cases

Joint involvement	Frequency	Percent
No	12	40.0%
Yes	18	60.0%
Total	30	100.0%

Distribution of After 3 month treatment in cases:

Children with vitamin D deficiency from both the groups were given 6 lakh units of Vit D3 (cholecalciferol) and were followed up for 3 months.

Table 6: Distribution of After 3 month treatment in cases

After 3 month treatment	Frequency	Percent
Improved	20	66.7%
persist	10	33.3%
Total	30	100.0%

DISCUSSION

Although Idiopathic musculoskeletal pain has many adverse implications on the lives³ of the affected children but little is known about the pathophysiology of these complaints. Some of the earlier studies have hypothesized a possible role of vitamin D deficiency in causation of IMSP.¹¹ We included children above 4 years of age as they could reliably express their pain complaints. Mean age of cases and controls in our study were similar. Most (50 %) of the subjects were in the age group of 6-9 years. According to earlier studies IMSP is most prevalent in adolescent age group.^{5,12} Our study was a hospital-based study and may not be reflective of prevalence in the population. In this study, males (53.3%) were more than females (46.7%). El Metwally *et al.* reported that girls experienced idiopathic musculoskeletal pain more frequently than boys⁷. Whereas Paladino *et al.* found no relation between gender and idiopathic musculoskeletal pain⁵. The predominance of males in our study could be

due to the social setup in which males are more frequently brought to medical services by parents than females. These findings of associated complaints in our study are in accordance with earlier studies.^{4,7} Sleep disturbances and behaviour disturbances have been attributed to increased perception of stressors by individuals with chronic pain.¹³ We found that a very high percentage (83.3 %) of patients with IMSP had vitamin D deficiency of varying severity. Various studies in adults and children have also reported a similarly high prevalence (ranging from 83-95.4%) of vitamin D deficiency in patients with musculoskeletal pain and low backache.¹⁴ However some studies have reported no association between vitamin D deficiency and musculoskeletal pain¹⁵. We found a relatively high prevalence of vitamin D deficiency in controls (26 %) also, the difference in mean value of vitamin D as compared to the cases was statistically significant ($P < 0.001$). Contradictory results have been reported by Szalay *et al.* who studied 46 children each with pain and without pain for vitamin D deficiency and did not find any significant difference between the vitamin D levels in the two groups ($p = 0.52$).¹⁶ In our study greater number of children with IMSP had moderate vitamin D deficiency as compared to controls (43 %/0%), and this was reflected most prominently in age group of 6-9 years with IMSP. Although in our study children who had pain at multiple site and higher frequency of pain episodes, had a relatively lower vitamin D levels as compared to children with single site pain the exact significance of this finding requires further evaluation with larger multicentric studies. A follow up done for 3 months after having received therapeutic doses of vitamin D in the deficient cases, majority (67 %) showed improvement in pain symptoms. Controls treated for vitamin D deficiency did not show appearance of any pain symptoms during 3 months follow up. From our study the finding of mild and moderate deficiency of vitamin D occurring in greater number of children with IMSP as compared to controls; lower vitamin D levels in children with IMSP at multiple sites and a higher frequency and improvement in pain after vitamin D replacement suggest that vitamin D might have some role in IMSP.

CONCLUSION

In this study the finding of mild and moderate deficiency of vitamin D occurring in greater number of children with IMSP as compared to controls; lower vitamin D levels in children with IMSP at multiple sites and a higher frequency and improvement in pain after vitamin D replacement suggest that vitamin D might have some role in IMSP. Vitamin D might have some role in IMSP and therefore assessment of Vitamin D in all the children with IMSP might be beneficial. Further longer duration studies

with more number children of various ethnicities are required to accept the conclusion universally.

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