

Severity of Growing Pain in Children and its Association with Vitamin D: A Tertiary Hospital Study

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Abstract:

Background: Growing pain (GP) is the most common form of nonspecific, recurrent leg pain in children. Some studies have found an association of vitamin-D with the severity of GP and observed remarkable pain improvement after vitamin D supplementation.

Objectives: To assess the severity of GP and serum level of vitamin D in children and to determine the association between them.

Methods: This cross-sectional study was conducted in the Department of Paediatrics, Bangabandhu Sheikh Mujib Medical University (BSMMU). Seventy children between 6-12 years were included in the study from March 2020 to August 2021. Children who fulfilled the Evans criteria of GP were enrolled and severity of GP was assessed by Wong-Baker Facies Scale in this study. Serum 25-hydroxy-vitamin-

D [25(OH)D] levels were measured and subsequently their association with the severity of growing pain were determined.

Results: In this study, 97.14% of growing pain patients had hypovitaminosis D and among them majority (87.14%) were vitamin D deficient. Moderate intensity of pain was found in 51.4% of children followed by severe (30%) and mild (18.6%) intensity of pain. Severity of pain was significantly associated with lower serum levels of vitamin D.

Conclusion: It may be concluded that most of the children with GP had hypovitaminosis D and severity of pain significantly increased with the decrement of serum vitamin D level.

Keywords: Growing pain, severity of pain, vitamin-D.

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Introduction:

Growing pain (GP) is the most common form of nonspecific, recurrent leg pain in childhood and a frequent cause for paediatric outpatient visits.¹ The prevalence of GP ranges from 2.6% to 49% and mainly affects children aged between 4–12 years.^{2,3} It is typically non-articular, intermittent, bilateral, and not associated with limited mobility. It usually occurs in the

evening or during the night which is in the muscles and predominantly affects the anterior thighs, shins, calves or backs of the knees.⁴ Physical examination does not reveal objective signs of inflammation and laboratory test results are normal.⁵ There is no single diagnostic test for growing pain, and it continued to be diagnosed based on both inclusion and exclusion criteria till 2008. Evan AM in 2008 proposed diagnostic criteria of growing pain which are accepted worldwide.²

Few studies have been done to elucidate the etiology and pathogenesis of GP. An interesting approach would be to consider calcium and vitamin D metabolism in aetio-pathogenesis of GP.⁶ Vitamin D maintains calcium and phosphorus within normal levels which is important for neuromuscular functioning and bone metabolism.⁷

A study done in a tertiary care hospital of Northern India found that 100% children with GP had hypovitaminosis D and 91.1% of them were deficient.⁸ A recent study in Bangladesh, shown that 92.15% of children with GP had vitamin D deficiency.⁹

A study conducted by Insaf AI in Iraq showed that majority (62.9%) of GP patients had moderate pain followed severe pain (37.1%).¹⁰ Morandi et al. in an Italian study observed significant pain improvement

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after 3 months of vitamin D supplementation with an increase in serum Vitamin D level which indicated an indirect relationship between vitamin D deficiency with severity of GP in children.¹¹

This study aimed to assess the severity of growing pain and serum vitamin D level and to determine the association between them.

Method:

This cross-sectional study was conducted at the paediatric rheumatology follow up clinic of Bangabandhu Sheikh Mujib Medical University (BSMMU), from March 2020 to August 2021. Seventy children aged 6-12 years, fulfilling the Evans criteria² of growing pain were enrolled in this study. Children with any systemic illness, rheumatologic disorders and children who had taken vitamin D, calcium, steroid or any other DMARD within 3 months were excluded from the study. Written consent was obtained from parents and ethical clearance from Institutional Review Board (IRB) of BSMMU was taken before enrollment of the study (Reference no: BSMMU/2020/4503 Date: 15/03/2020). Demographic variables, characteristics of growing pain and serum vitamin D status were recorded in a pre-designed questionnaire.

Serum 25(OH)D was determined by chemiluminescent microparticle immunoassay (CMA) technique using SIEMENS ADVIA centaur XPT in laboratory of National Institute of Nuclear Medicine and Allied Science (NINMAS), BSMMU. Depending on their vitamin D level, patients were classified into 3 categories: levels <20 ng/ml as Vitamin D deficiency; levels 20 to 30 ng/ml as Vitamin D Insufficiency and: levels e" 30 ng/ml as Vitamin D sufficiency.¹⁰ Both the vitamin D insufficiency and deficiency groups were considered as Hypovitaminosis D.

To assess pain intensity, Wong–Baker Faces Pain Rating Scale¹¹ was used in this study. It included a horizontal line of 6 hand-drawn faces, scored from 0 to 10, that ranged from a smiling face on the left to a crying face on the right (hardly noticeable pain versus strongest conceivable pain). Parents and older patients were asked to look at the faces scale and select the face which resembled the pain intensity of the patient.¹¹ Finally assessment score was recorded in the pre-designed questionnaire.

Statistical analysis was performed by SPSS (statistical program for social science) for version 22. Comparison of severity of pain with serum vitamin D level among study

subjects were done with one way ANOVA test. A *p* value of <0.05 was considered as statistically significant.

Results:

Seventy children with GP were included in the present study. Table I shows the demographic data of children with GP. Most (72.9%) of the children were more than 10-year-old, 62.9% were male. Table I shows the characteristics of growing pain. Sixty-four patients (91.4%) complained about calf muscle pain. Pain was relieved after limb massage in 58.6% patients. Sleep disturbance was found in 25.7% of patients followed by difficulty in playing and hampered schooling. Headache and abdominal pain were present in 48.6% and 44.3% of GP children respectively. Most (97.14%)

Table I

Characteristics of growing pain (N= 70).

Item	Number (N=70)	Percentage
Site of pain		
Calf muscles	64	91.4%
Front of thigh	42	60.0%
Back of Knee	40	57.1%
Time of pain		
Evening	23	32.9%
Night	47	67.1%
Total duration of illness		
d" 6 months	10	14.3%
7-12 months	27	38.6%
13-24 months	22	31.4%
>24 months	11	15.7%
Duration of painful episodes		
d" 30 minutes	30	42.9%
31-60 minutes	26	37.1%
>60 minutes	14	20.0%
Relieving factors		
Massage	41	58.6%
Medicine	16	22.9%
Spontaneously	13	18.5%
Hampered daily activities		
Sleep	18	25.7%
Playing	14	20.0%
Schooling	4	5.7%
No hamper of daily activities	34	48.6%
Associated symptoms		
Headache	34	48.6%
Abdominal pain	31	44.3%
None	29	41.4%

of them had hypovitaminosis D and only 2.86% patients had sufficient level [Figure I]. Most of the patients (51.4%) presented with moderate pain followed by severe (30%) and mild (18.6%) intensity of pain (Table II). Table III shows comparison of severity of pain with serum vitamin D level. It is found that the severity of pain was significantly higher with lower levels of serum vitamin D compared ($p < 0.0001$).

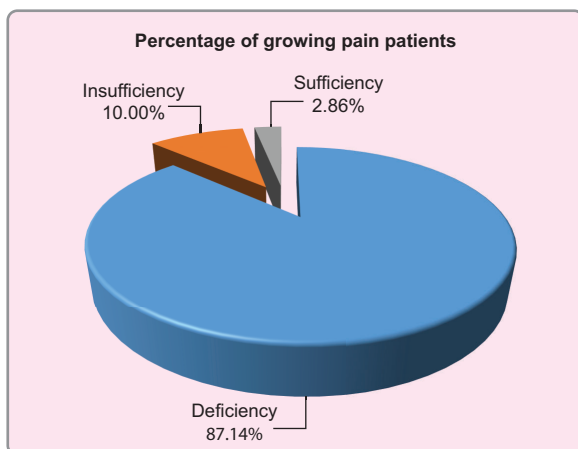


Fig.-1: Vitamin D status among the study subjects ($n=70$).

Table-II

Assessment of intensity of pain among children with growing pain by Wong-Baker Faces Pain Rating Scale ($n=70$).

Severity of pain	Number ($n=70$)	Percentage
(Score in Facial pain scale)		
Mild pain (1-3)	13	18.6%
Moderate pain (4-6)	36	51.4%
Severe pain (7-10)	21	30%

Table-III

Comparison of intensity of pain with serum vitamin D level among study cases ($n=70$).

Severity of pain (Score in Facial pain scale)	S. vitamin- D level (ng/ml) (mean \pm SD)	p value
Mild pain ($n=13$)	21.19 \pm 2.03	<0.0001*
Moderate pain ($n=36$)	15.10 \pm 2.95	
Severe pain ($n=21$)	7.80 \pm 2.22	

*One way ANOVA test was performed.

Discussion:

Recurrent lower limb pains, termed growing pains or growth pains, constitute the most frequent cause of musculoskeletal pain in children.¹¹ Literature suggested significant association of growing pain with Vitamin D level and bone mineral status in the different studies. Our study aimed to assess the severity of GP, vitamin D status and to detect their association between them.

Age distribution of growing pain children was between 6-12 years and highest numbers of cases (72.9%) were found in more than 10-year age group in the present study. Haque et al. in a Bangladeshi community study observed that 8-9 year age group had maximum number of cases.¹² An Australian community study demonstrated 37% of GP in children were within 4-6 years age group.¹³ The reason behind this late presentation in the present study could be due to this was a hospital based study and many of these patients were initially diagnosed as cases of rheumatic fever or juvenile idiopathic arthritis (JIA) and treated with penicillin prophylaxis, NSAIDs and steroids. Later, they were diagnosed as growing pain at this referral hospital.

In the current study, boys were found to be predominant. This finding is consistent with the Haque et al. study, where 60.7% were boys.⁹ In a Turkish study done by Vehapoglu et al. found that most (56.6%) of the GP cases were girls.¹ This dissimilarity may prove that boys are getting more care due to socio-cultural context in our country.

In the present study, calf muscle pain was the commonest site followed by front of thigh and back of knee. These findings were consistent to Insaf AI study findings, where 51.4% experienced calf muscle pain, followed by front of thigh and back of knee pain.¹⁰ Majority of children experienced pain at night (67.1%) followed by at evening (32.9%), which is consistent with the studies conducted by Haque et al. and Kaspiris et al.^{12,14}

Growing pain did not hamper any activities in 48.6% of the cases in our study. Some of the children experienced sleep disturbance followed by difficulty in playing and schooling. These findings were also in accordance with the study conducted by Haque et al. where 42.5% of children with growing pain did not complain of any difficulty in daily activities.¹² The present study found that pain was associated with headache followed by

abdominal pain which was similar to the study findings by Oster and Neilsen.¹⁵ These observations may indicate that these children have increased susceptibility to other pains and aches including headache and abdominal pain.

A study done by Sharma et al. in a tertiary hospital of Northern India found that 100% children with GP had hypovitaminosis D and 91.1% of them were deficient.⁸ Another study conducted in Pakistan reported that 94% of children with growing pains had hypovitaminosis D and 72% of them had vitamin D deficiency.¹⁶ Another study from our center reported that 92.15% of children with growing pains had hypovitaminosis D.⁹ These findings were similar with the observations in our study which signifies that child with GP were commonly vitamin D deficient. Low vitamin-D status adversely affects bone mass, bone turn-over and muscle strength in children, which could very well contribute to causation of GP in children.¹⁷

Severity of pain were mostly moderate (51.4%) and severe (30%) in this study. The study done by Insaf AI in Iraq had similar findings where 62.9% experienced moderate pain followed by severe pain in 37.1%.¹⁰ This could be because, most of the parents and children ignore mild pain and they do not attend health care centers.

In the present study, severity of pain significantly increased with decrement of serum vitamin D level ($p < 0.0001$). Morandi et al. in another study did not find any correlation between initial 25-OH-D values and the intensity of pain but they observed significant pain improvement after 3 months of vitamin D supplementation with an increase in 25-OH-D values.¹¹ This observation may provide an indirect relationship between levels of vitamin D deficiency with severity of pain. In a state of vitamin D deficiency along with PTH stimulation, osteoblasts continue to deposit collagen rubbery matrix on both the endosteal and periosteal surfaces of the skeleton, this matrix expands under the periosteal covering and could cause an outward pressure on periosteal sensory pain fibers.¹⁸

Conclusion:

In this study, majority (97.14%) of children with growing pain had hypovitaminosis D and among them vitamin D deficiency was predominant. Severity of pain in children with growing pain significantly increased with the decrement of serum vitamin D level.

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