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A CROSS-SECTIONAL STUDY ON THE PREVALENCE OF VITAMIN D DEFICIENCY IN CHILDREN WITH CHRONIC MUSCULOSKELETAL PAIN AND ITS COMPARISON WITH RESPECT TO JOINT HYPERMOBILITY AT PATNA MEDICAL COLLEGE, BIHAR

Pediatrics

Rajesh Kumar Academic JR , Upgraded Department Of Pediatrics, PMCH , Patna

Nikhil Kumar* Academic JR , Upgraded Department Of Pediatrics, PMCH , Patna. *Corresponding Author

C B Kumar Associate Professor , Upgraded Department Of Pediatrics , PMCH , Patna

ABSTRACT

Joint hypermobility or laxity is having a range of motion beyond the limits of normal joint. It can affect one or more joints. **Methodology:** A cross-sectional study was conducted in the Department of Pediatric, Patna Medical College & Hospital, Patna, Bihar from January 2016 to December 2017, after taking the approval of the protocol review committee and institutional ethics committee. **Results:** A total of 100 children (61% girls and 39% boys) were included in the current study. The mean age of the children was 8.5 ± 2.4 years were included. Most participants (78%) were 5 to 10 years of age. Basedon Modified Criteria of Carter and Wilkinson, 50 children(50%) with musculoskeletal pain had joint hypermobility. Basedon laboratorydata,87 (87%) children had vitamin D deficiency. **Conclusions:** There was no significant difference regarding vitamin Ddeficiency between children with or without hypermobility. More attention should bepaid to the roleofvitamin D in the management of chronic musculoskeletal pain in pediatrics.

KEYWORDS

Vitamin D Deficiency, Musculoskeletal Pain, Joint Hypermobility

Introduction

Joint hypermobility or laxity is having a range of motion beyond the limits of normal joint. It can affect one or more joints. Beighton scoring (BS), where in nine joints are evaluated, is used to define Joint hypermobility and BS 4-6/9 is reported as generalized joint hypermobility (GJH) [1,2]. Hypermobility brings with it many problems as musculoskeletal or systemic manifestations. Musculoskeletal manifestations are traumas, degenerative joint and bone diseases, disturbed proprioception, muscle weakness and musculoskeletal traits. Systemic manifestations are cardiovascular involvements, skin, mucosae, fascia involvement, and nervous system involvement [2].

Joint hypermobility is common in childhood, occurring in 8–39% of school age children [3-6]. Prevalence depends on age, sex and ethnicity and decreases with increasing age. Girls are generally more hypermobile than boys and children from Asian backgrounds are generally more hypermobile than Caucasian children [7]. Vitamin D is an essential component of bone and mineral metabolism. It is required to accelerate calcium absorption in the intestine and is essential for normal growth-plate calcification and bone mineralization. It plays a significant role in the homeostasis of calcium and phosphorus and is vital for bone mineralization, skeletal growth and bone health. A normal vitamin D status seems to be protective against musculoskeletal disorders (muscle weakness, falls and fractures), infectious disease, autoimmune disease, cardiovascular disease, types 1 and 2 diabetes mellitus, several types of cancer, neurocognitive dysfunction and mental illness [8,9].

An association between the vitamin D level and chronic pain conditions has been described in adults; the patients' pain condition improved with vitamin D supplementation [10,11].Turkeyreceives a high level of sunlight, and vitamin D deficiency was thus thought to be unusual here; however, the reported prevalence of hypovitaminosis D is 40–65% in this country[12,13]. In thepresent study, therefore, aims to evaluate the prevalence of vitamin Ddeficiency in Indian childrenwith chronic musculoskeletal pain and compared vitamin D level in childrenwith andwithout jointhypermobility.

Methodology

A cross-sectional study was conducted in the Department of Pediatric, Patna Medical College & Hospital, Patna, Bihar from January 2016 to December 2017, after taking the approval of the protocol review committee and institutional ethics committee. Total 100 children already diagnosed with chronic musculoskeletal pain were included in this study. The children underwent a thorough history and physical examination. Data, including age, sex, weight, height and hypermobility of joints were recorded. Weight and height were measured using a digital scale and tape meter, respectively. Body Mass Index (BMI) was calculated as weight in kilograms divided by height in squared meters. Diagnosis of joint hypermobility depended on the presence of at least 3 of 5 Modified Criteria of Carter and Wilkinson, including touching thumb to volar forearm, hyperextension of metacarpophalangeal joints so fingers parallel forearm, >10° hyperextension of elbows, >10° hyperextension of knees, and touching palms to floor with knees straight [14]. A 5 ml sample of venous blood was taken from each patient, centrifuged for 15 minutes and stored at -18° C until analysis. After completion of patient selection, all samples were analyzed. Serum 25-hydroxy vitamin D (25-(OH)D) was measured by radioimmunoassaymethod. A 25-(OH) D level of <30 ng/mL was considered deficiency.

Inclusion criteria:

the study included healthy children aged ≤ 14 years with recurrent episodes of musculoskeletal pain within the past month to most recently 7 days before attending our outpatient clinic, who were diagnosed with chronic musculoskeletal pain.

Exclusion criteria:

Those with a history of fracture, vitamin D administration, and corticosteroid administration, any underlying rheumatologic disease, Ehlers–Danlos syndrome, Marfan syndrome, and serum calcium or phosphorus imbalance were excluded from the study. Children who had any abnormal signs on physical examination such as swelling, erythema, tenderness or limited range of motion of joints were also excluded.

Statistical Analysis:

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2010) and then exported to data editor page of SPSS version 19 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics included computation of percentages. Test applied for the analysis was chi-square test. The level of confidence interval and p-value were set at 95% and 5%.

Results

A total of 100 children (61% girls and 39% boys) were included in the current study. The mean age of the children was 8.5 ± 2.4 years were included. Most participants (78%) were 5 to 10 years of age. Basedon Modified Criteria of Carter and Wilkinson, 50 children(50%) with musculoskeletal pain had joint hypermobility. Basedon laboratorydata,87 (87%) children had vitamin D deficiency. Data was further compared across the two groups with andwithout hypermobility.Childrenwith musculoskeletal pain and hypermobility were significantly younger and had significantly lower BMI compared to those without hypermobility. Children without hypermobility had a lower vitamin D level and higher prevalence of vitamin D deficiency compared to those with hypermobility. However,the difference was

not statistically significant.Demographic, clinicaland laboratory characteristics of participants has been shown in Table 1,2.

Parameter	Children with hyperlaxity (N = 50, %)	Children without hyperlaxity (N = 50, %)	P value
Gender Male Female	 17 (34%) 33 (66%)	 22 (44%) 28 (56%)	 0.3
Age <5 years 5-10 years >10 years	 7 (14%) 41 (82%) 2 (4%)	 5 (10%) 37 (54%) 8 (16%)	 0.2

Table 1: Demographic profile of the study participants (N = 100)

Parameter	Children with hyperlaxity (N = 50, %)	Children without hyperlaxity (N = 50, %)	P Value
BMI (in kg/m^2) < 15 15-20 >20	 4 (8%) 43 (86%) 3 (6%)	 2 (4%) 38 (76%) 10 (20%)	 0.021
Serum Vitamin D (ng/ml)	19.8±12.7	17±9.4	0.3
Vitamin D deficiency (<30 ng/ml)	41 (82%)	46 (92%)	0.2

Table 2: Clinical and laboratory parameters of the study participants (N = 100)

Discussion

Chronic musculoskeletal pain is one of the most common pediatric pain syndromes, and may occur together with joint hypermobility, which is another common condition in children and adolescents. The both conditions are associated with significant morbidity and healthcare costs [15-17]. Vitamin D supplementation has been suggested to improve the outcome in children with chronic musculoskeletal pain [17-19]. This study assessed the prevalence of vitamin D deficiency in children with chronic musculoskeletal pain, and compared vitamin D levels in children with and without joint hypermobility. In the present study results showed a high prevalence of vitamin D deficiency among children and adolescents with chronic musculoskeletal pain. The prevalence of vitamin D insufficiency (25-(OH)D <30 ng/mL) among our patients was 87%, which is considerably higher than the prevalence of vitamin D insufficiency in healthy Indian children and adolescents reported in a recent systematic reviewandmeta-analysis[20].Our results are approximately similar to those of Park et al., who reported vitamin D levels of <30 ng/mL in 95% of Korean children and adolescents with nonspecific lower extremity pains[19], but higher than reports from UK and Canada[21,22].Vitamin D deficiency is also highly prevalent in adults with musculoskeletal pain. According to Plotnikoff and Quigley, 93% of adult patients with persistent nonspecific musculoskeletal pain had 25-(OH)Dlevels<20 ng/ml[23]. Heidari et al. also reported vitamin D deficiency in 63.4% of Indian adults with chronic musculoskeletalpain[24]. Some studies have shown that vitamin D therapy can improve musculoskeletal pain in pediatric population. According to a pilot study by Blagojevic et al, a 6-month prescription of vitamin D supplements reduces pain intensityand improves mobility anddaily functioning in childrenwith musculoskeletal conditions[17].The positive effectof vitaminDonchronic musculoskeletal pain in childrenhas also been shownbyVehapogluetal, who reportedasignificant reduction in pain intensity among children with growth pains after a single oral dose ofvitamin D[25].While joint hypermobility is regarded as a major predisposing factor for musculoskeletal pain, our results showed that the difference regarding the prevalence of vitaminD deficiencywas not statistically significant, probably due to the high prevalence of 25-(OH)Ddeficiency in our patients. In a recent study on female university students with and without generalized joint hypermobility, Tuna et al. found a similar frequency of vitamin D deficiency in the two groups[26]. Consideringthe high prevalence of vitamin D deficiency in our study population, this finding implies that 25-(OH)D serum level should be assessed in all children withchronic musculoskeletal pain, regardless of the existence of joint hypermobility.

Conclusion

We reported a high prevalence of vitamin D deficiency in Indian children diagnosed with chronic musculoskeletalpain.There was no significant difference regarding vitamin Ddeficiency between children with or without hypermobility. More attention should bepaid to the roleofvitamin D in the management of chronic musculoskeletal pain in pediatrics.

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REFERENCES

1. Beighton P,De Paepe A, Steinmann B, Tsipouras P, Wenstrup RJ. Ehlers-Danlos syndromes: revised nosology. Villefranche, 1997. Ehlers-Danlos NationalFoundation(USA)and EhlersDanlos Support Group (UK). Am J Med Genet 1988;77:31-7.
2. Castori M, Tinkle B, LevyH, Grahame R, Malfait F, Hakim A. A framework for the classification of joint hypermobility and related conditions. Am J Med Genet C Semin Med Genet C Semin Med Genet 2017;175:148-573.
3. Larsson LG, Baum J, Mudholkar GS, Srivastava DK: Hypermobility: prevalence andfeatures in a Swedish population. Br J Rheumatol 1993, 32:116-119.
4. Decoster LC, Vailas JC, Lindsay RH, Williams GR: Prevalence and features of joint hypermobility among adolescent athletes. Arch PediatrAdolesc Med 1997, 151:989-992.
5. Forleo LH, Hilario MO, Peixoto AL, Naspitz C, Goldenberg J: Articular hypermobility in school children in Sao Paulo, Brazil. J Rheumatol 1993, 20:916-917.
6. Rikken-Bultman DG, Wellink L, van Dongen PW: Hypermobility in two Dutch school populations. Eur J ObstetGynecolReprod Biol 1997; 73:189-192.
7. Remvig L, Jensen DV, Ward RC: Epidemiology of general joint hypermobilityand basis for the proposed criteria for benign joint hypermobility syndrome: review of the literature. J Rheumatol 2007, 34:804-809.
8. Pludowski P, Holick MF, Pilz S. Vitamin D effects on musculoskeletal health, immunity, autoimmunity, cardiovascular disease, cancer, fertility, pregnancy, dementia and mortality –a review of recent evidence. Autoimmun Rev 2013; 12:976–989.
9. Vujosevic S, Borozan S, Radojevic N. Relationship between 25-hydroxyvitamin D and newly diagnosed type 2 diabetes mellitus in postmenopausal women with osteoporosis. Med PrincPract 2014; 23:229–233.
10. de Rezende Pena C, Grillo LP, Das Chagas Medeiros MM. Evaluation of 25hydroxyvitamin D serumlevels in patientswith fibromyalgia.JClinRheumatol2010;16:365–369.
11. Tandeter H, Grynbaum M, Zuili I, et al: Serum 25-OH vitamin D levels in patients with fibromyalgia. Isr Med Assoc J 2009;11:339–342.
12. Andıran N, Celik N, Akca H. Vitamin D deficiency in children and adolescents. J Clin Res Pediatr Endocrinol 2012;4:25–29.
13. Islam O, Cizmecioglu F. Subclinical vitamin D deficiency is increased in adolescent girlswho wear concealing clothing. J Nutr 2005;135:218–222.
14. Carter C, Wilkinson J. Persistent Joint Laxity and Congenital Dislocation of The Hip. J Bone Joint Surg Br. 1964; 46:40-43.
15. Kamper SJ, Henschke N, Hestbaek L, Dunn KM, Williams CM. Musculoskeletal pain inchildren and adolescents. Braz J PhysTher. 2016; 20(3):275-841.
16. McCluskeyG,O'Kane E, Hann D, Weekes J, Rooney M.Hypermobility and musculoskeletal pain in children: a systematic review. Scand JRheumatol 2012; 41:329–38.
17. Blagojevic Z, Nikolic V, Kisic-Tepavcevic D, Terzic Supic Z, Kovacevic R, Zivkovic Z. Musculoskeletal PainandVitamin D Deficiency in Children: A PilotFollow-up Study of VitaminDTherapy inMusculoskeletal/Orthopedic Conditions.Acta ChirOrthopTraumatol Cech. 2016; 83(1): 21-6.
18. Mahmoodzadeh H, Nasimfar A, Sadeghi E, Macooie A, GazaviA, RasouliJ. StudyofVitamin D Level in Children with Non-specific Musculoskeletal Pain. International Journal of Pediatrics 2017; 5(3): 4533-40.
19. Park MJ, Lee J, Lee JK, Joo SY. Prevalence of Vitamin D Deficiencyin Korean Children Presenting withNonspecific Lower-Extremity Pain. Yonsei Med J. 2015; 56(5):1384–88.
20. Jazayeri M, MoradiY,Rasti A, Nakhjavani M, Kamali M, Baradaran HR. Prevalence of vitamin D deficiencyin healthyIranian children: A systematic review and meta-analysis. Med J Islam Repub Iran. 2018; 32:83.
21. Davies JH, Reed JM, Blake E, Priesemann M, Jackson AA, Clarke NM. Epidemiology of vitamin D deficiency in children presenting to a pediatric orthopaedic service in the UK. JPediatrOrthop 2011; 31: 798-802.
22. McNallyJD, Matheson LA, RosenbergAM. Epidemiologic considerationsin unexplained pediatric arthralgia: the role ofseason, school, and stress. J Rheumatol 2009; 36:427-33.
23. Plotnikoff GA, Quigley JM. Prevalence of severe hypovitaminosis D in patients with persistent, nonspecific musculoskeletal pain. Mayo Clin Proc 2003;78:1463-70.
24. Heidari B, Shirvani JS, Firouzjahi A, Heidari P, Hajian-Tilaki KO. Association between nonspecific skeletal pain and vitamin D deficiency. Int J Rheum Dis 2010;13:340-6.
25. Vehapoglu A,Turel O, Turkmen S, Inal BB, Aksoy T, Ozgurhan G. Are Growing Pains Related to Vitamin D Deficiency?Efficacyof Vitamin D Therapy for Resolution of Symptoms. Med PrincPract. 2015; 24(4):332–338.
26. TunaF, Özdemir H, Kabayel DD, Doğanlar ZB. Is thereadifference in 25-hydroxyvitamin D levels between female university students withand without joint hypermobility? The European Research Journal 2019; 5(4):576-581.