Hypermobility is related with musculoskeletal pain in Indian school-children

B. Abujam, A. Aggarwal

Department of Clinical Immunology, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, India.

Abstract

Objective

Hypermobility in children is common, however, its association with musculoskeletal pain remains controversial. There is lack of data from developing countries like India. This study aimed to look at the prevalence of musculoskeletal complaints and hypermobility in Indian school children

Methods

This was a cross-sectional, school-based study. Initially, a questionnaire regarding musculoskeletal pain was filled in by the schoolchildren (or their parents), and then verified. Three questions, including joint pain, back pain or ankle/foot pain for more than 1 week, were included for the purpose of this study. Subsequently, an abbreviated musculoskeletal examination (pGALS) was done and all children were checked for hypermobility (Beighton score). Odds ratios (with 95% confidence intervals) were calculated using contingency table (chi-square test) to examine the association of musculoskeletal pain with hypermobility (using different Beighton score cut-offs).

Results

One thousand eight hundred and thirty-eight children were included (742 girls and 1096 boys), with mean age of 11.5±2.9 years. Joint pain was reported in 113 (6.1%), back pain in 52 (2.8%) and ankle/foot pain in 53 (2.9%). Prevalence of hypermobility was dependant on the definition used, varying from 816 children (44.4%) to 1081 (58.8%) when using the Beighton score ≥6 or ≥4, respectively. Odds ratio of having hypermobility (Beighton score ≥4) in children with joint pain, back and ankle pain was 4.2 (95%CI 2.5–7.2), 3.4 (95%CI 1.7–7.1) and 1.9 (95%CI 1.1–3.7), respectively.

Conclusion

We found that a large proportion of Indian school children had hypermobility. There was an association between the presence of joint, back or ankle/foot pain with hypermobility in Indian school children. This association was strongest when a Beighton score cut-off of 4 was used to define hypermobility.

Key words

musculoskeletal pain, childhood, hypermobility

Bonnie Abujam, MD, DM Sen. Res. Ass.
Amita Aggarwal, MD, DM, Prof.

Please address correspondence to:
Prof. Amita Aggarwal,
Department of Clinical Immunology,
Sanjay Gandhi Postgraduate Institute of Medical Sciences,
140020 Lucknow, India.
E-mail: aa.amita@gmail.com
amita@sgpgi.ac.in

Received on November 4, 2013; accepted in revised form on February 10, 2014.

Competing interests: none declared.

Introduction

Musculoskeletal pain is a common complaint in the paediatric population with a prevalence ranging from 5–19% (1). At the same time, joint hypermobility is also common, with prevalence estimated to be as high as 58.7% (2). The association between hypermobility and musculoskeletal pain, however, remains controversial. Furthermore, there are scant data from developing countries like India.

The current study was undertaken to know the prevalence of hypermobility and its relationship to musculoskeletal complaints in school children from Northern India.

Patients and methods

This was a cross-sectional epidemiological study, conducted from March 2010 to April 2011 in 4 schools in children in the age group 6–17 years. These schools were chosen because of convenience, as they were located near our hospital. Written consent was taken from the school authority for conducting the study. The Institutional Ethics Committee approved the study.

Although a total of 2059 children were included, only 1838 could be examined for hypermobility and these are included in this study. Questionnaires in the local language (Hindi) and English were distributed to all the children through their respective class teacher or the school nurse. The questionnaire had to be filled by the parents in case of children less than 14 years of age, but older children above 14 years were given the option of filling it up by themselves. The questionnaire was adapted from a previous study that had validated it as a tool for early detection of musculoskeletal problems in children that need rheumatologic evaluation (3). This questionnaire contained the questions regarding presence of joint, back or ankle/foot pain, red eye, prolonged fever with joint pains, participation in sports, etc. For the purpose of this study, three questions were included: (a) presence of symptoms of peripheral joint pain or swelling of more than 1 week, (b) presence of back pain of more than 1 week, and (c) presence of heel or ankle pain of more than one week.

Subsequently, all children were met and a single examiner (B. Abujam), a clinical fellow in Rheumatology with more than two years experience in an academic rheumatology unit, performed the interview/examination in the school premises. This comprised re-confirmation of the musculoskeletal complaints, noted by the parents/children in the questionnaire and a physical examination comprising an abbreviated paediatric musculoskeletal examination (pGALS). Only those musculoskeletal complaints that were reconfirmed on direct interview were included for this study. Evidence of hypermobility was done according to the Beighton's scoring (4). Children with musculoskeletal complaints were divided into two groups, as per the presence or absence of hypermobility (defined by different cut-offs of Beighton score). Odds ratios of presence of hypermobility in children with musculoskeletal pain were calculated using the chi-square test and 95% confidence intervals obtained (OpenEpi: Open Source Epidemiologic Statistics for Public Health) (5).

Results

A total of 1838 children were included in this study (742 girls and 1096 boys). They had a mean age of 11.5±2.9 years. They were equally distributed between the various age groups: 6–9 years (562), 10–13 years (682) and older than 14 years (594). Musculoskeletal pain that lasted at least one week was reported by 218 children (11.9%). This included joint pain in 113 (6.1%), back pain in 52 (2.8%) and ankle/foot pain in 53 (2.9%).

The prevalence of hypermobility was dependant on the definition used. Using a Beighton score ≥6, hypermobility was found in 816 children (44.4%). Using lower cut-offs for the Beighton score, *i.e.* using a cut-off of 5 or ≥4 led to an increase to 844 (46%) and 1081 (58.8%), respectively. A higher proportion of children in the lower age group had hypermobility (in all the Beighton cut-offs) compared to their counterparts in older age groups (Fig. 1). However, there was no difference in hypermobility (using any cut-off) in girls compared to boys (Fig. 2).

Children with musculoskeletal pain were more likely to have hypermobility (as defined by various cut-offs). The

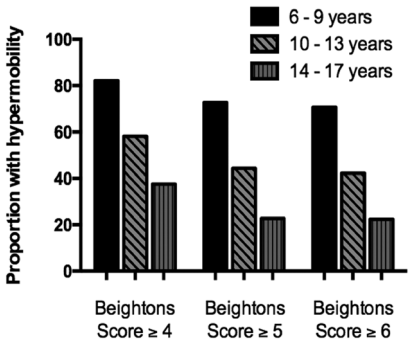

Fig. 1. Prevalence of hypermobility in different age groups as per the Beighton score cut-off used; $p<0.01$ between 6–9 years, 10–13 years and 14–17 years in all three Beighton cut-offs.

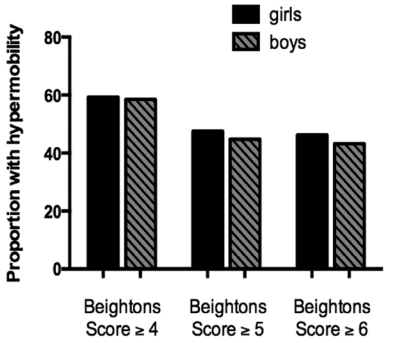

Fig. 2. Prevalence of hypermobility in girls and boys as per the Beighton score cut-off used (*p*: ns between girls and boys).

odds ratio for having hypermobility (defined by Beighton ≥4) in children with joint pain, back and ankle pain was 4.2 (95%CI 2.5–7.2), 3.4 (95%CI 1.7–7.1) and 1.9 (95%CI 1.1–3.7), respectively. This association varied with the Beighton score cut-offs (Table I).

Discussion

This study found a high prevalence of hypermobility in Indian children varying from 44.4% to 58.8% using Beighton score ≥6 and ≥4, respectively, to define hypermobility. There was a positive association between musculoskeletal pain and hypermobility.

Our prevalence figures are similar to those found by a previous Indian study from Mumbai, which included 829 children between the ages of 3 and 19 years, and found the prevalence of hypermobility to be 58.7% (Beighton cut-off of ≥4) (2). A study from neighbouring Pakistan, found hypermobility (Beightons ≥4) in 37% of children between 4 to 18 years of age (6). However, previous studies from other countries (and continents) have generally found lower rates of hypermobility, varying from 13–35% in countries like Israel, Egypt, Canada and the United Kingdom (7-11) (Table II). In a recent large study of 6022 children from the United Kingdom, hypermobility was present (Beightons ≥4) in 27.5% of girls and 10.6% in boys (12). Another recent study from Netherlands found hypermobility (Beightons ≥4) to be present in 35% in 551 children aged 6 to 12 years (13). However, some studies from European countries also found high rates of hypermobility upto 55% (14). These data do suggest that children of Asian-Indian origin have higher rates of hypermobility than their counterparts of other ethnicities. Indeed, this has been suggested in early studies using radiology in the 1940s as well (15). This may be true of Asians in general as suggested by higher hypermobility in Chinese compared to Caucasian children (16). Our study did not find any gender predilection in the prevalence of hypermobility, which is similar to earlier studies from India and Pakistan unlike studies in Caucasian and European children that have demonstrated higher prevalence in girls (11, 16-18) (Table II). However, this lack of gender predilection has also been found in a large cohort of Chinese, Brazilian, Finnish and a small cohort of North American and Spanish children (8, 10, 14, 16). The reason for this discordance across different ethnicities is unexplained. We speculate that this may be related to different level of nutrition and skeletal structure that may abrogate increased laxity expected secondary to sex hormones. Our observation of gradual decline in the prevalence of hypermobility with age in children is supported by previous studies (7, 19, 20). This is not surprising, as it may be related to the immature skeletal framework at younger ages.

This study found a positive association between hypermobility and musculoskeletal complaints. The odds ratios for joint pain were significant across all Beighton cut-offs used, and varied from 2.5 to 4.2, being highest with Beighton ≥4. Similarly, the odds ratio for back pain and ankle pain were highest with Beighton ≥4, and attained borderline significance with higher cut-offs. The association of hypermobility with musculoskeletal pain has been found in many earlier studies (2, 6, 8, 9, 14, 21, 22). However, some studies have found no association (10, 23-25) (Table II). A recent systemic review which included 15 studies, found Afro-Asian children had an association of hypermobility and joint pain (OR 2.01, 95%CI 1.45–2.77), whereas European children showed no association (OR 1.00, 95%CI 0.79–1.26) (26). This may be related to the lower prevalence of hypermobility *per se*, or may reflect other differences in ethnicity (like pain tolerance) and muscle strength.

The strength of our study is the number

Table I. The association between the presence of musculoskeletal pain and hypermobility in children (n=1838).

Prevalence of MSK complaints→		Joint pains >1week n (%)			Back pain >1 week n (%)			Ankle/Foot pain n (%)		
Presence of hypermobility n (%) n=1838 (100) ↓		Present 113 (6.1)	Absent 1725 (93.9)	Odds ratio (95%CI)	Present 52 (2.8)	Absent 1786 (97.2)	Odds ratio (95%CI)	Present 53 (2.9)	Absent 1785 (97.1)	Odds ratio (95%CI)
Beighton ≥6	Yes 816 (44.4)	74	742	**2.5 (1.7–3.7)**	30	786	**1.7 (1.0–3.0)**	30	816	**1.7 (1.0–2.9)**
	No 1022 (55.6)	39	983		22	1000		23	969	
Beighton ≥5	Yes 844 (47.3)	76	768	**2.6 (1.7–3.8)**	30	814	**1.6 (1.0–2.8)**	30	814	**1.6 (0.9–2.7)**
	No 994 (52.8)	37	957		22	972		23	971	
Beighton ≥4	Yes 1081(58.8)	96	985	**4.2 (2.5–7.2)**	43	1038	**3.4 (1.7–7.1)**	39	1042	**1.9 (1.1–3.7)**
	No 757 (41.2)	17	740		9	748		14	743	

Table II. Studies showing prevalence of hypermobility, gender difference and its association with musculoskeletal complaints in children.

Author, country, year of publication	Sample size	Age range (years)	Male: Female	Scoring/cut-off	Hypermobility (%)	Gender difference in hypermobility
Studies showing a Positive association of hypermobility and MSK pain						
Arroyo *et al*., USA, 1998 (8)	192	5–19	109:83	NS	34	No
Gedalia *et al*., Israel, 1991 (27)	338	9–15	179:159	Carter and bird	13	No
El Garf *et al*., Egypt, 1998 (11)	997	6–15	499:498	Beightons ≥4	16.1	No
Hasija *et al*., India, 2008 (2)	829	3–19	436:393	Beightons ≥4	58.7	No
Qureshi *et al*., Pakistan, 2010 (6)	872	4-18	–	Beightons ≥4	37	No
Tobias *et al*.[#], United Kingdom, 2013 (9)	2901	13.8[a]	1267:1634	Beightons ≥6	4.7	Yes
Sperotto *et al*., Italy, 2013 (22)	289	8–13	146:143		13.2	
Current study	1839	6–17	1096:742	Beightons ≥6	44.4	No
Studies showing a Negative association of hypermobility and MSK pain						
Mikkelson *et al*., Finland, 1996 (10)	1637	9.8–11.8	–	Beightons ≥6	7.8	No
Qvindesland A *et al*., Iceland, 1999 (25)	267	12[a]	124:143	Beightons ≥4	40.5 (boys) 12.9 (girls)	Yes
De inocencio *et al*., Spain, 2004 (14)	222	4–14	–	Beightons ≥4	55.0	No
Leone *et al*., Italy, 2009 (24)	1046	5–14	530:516	Beightons ≥5	22.23	Yes

NS: not specified; MSK: musculoskeletal complaints; [a]mean;*p<0.001;**p=not significant. [#]Cohort study, hypermobilty examined at 13.8 years, MSK at 17.8 years.

of school children included and examination by a single observer. We have examined different Beighton cut-offs, and found that a Beighton score cut off of ≥4 had the highest odds ratios. This may suggest that in our children, this cut off could be more meaningful in a child with musculoskeletal complaints who comes to the clinic. The major limitation is the non-random selection of schools and lack of data on nutritional status and other confounding factors like psychosocial stress that could contribute to the musculoskeletal pain.

Conclusion

To conclude, both musculoskeletal pain and hypermobility were common in this school-based study and there was a positive association between them. A Beighton score ≥4 had the highest odds ratios for musculoskeletal pain and may be more appropriate to use in our setting.

Acknowledgements

We thank the school principals, teachers, parents, and all the children for their help, cooperation and enthusiasm in participating in this study.

References

1. ZIV A, BOULET JR, SLAP GB: Utilization of physician offices by adolescents in the United States. *Pediatrics* 1999; 104: 35-42.
2. HASIJA RP, KHUBCHANDANI RP, SHENOI S: Joint hypermobility in Indian children. *Clin Exp Rheumatol* 2008; 26: 146-50.
3. LEN CA, TERRERI MT, PUCCINI RF *et al*.: Development of a tool for early referral of children and adolescents with signs and symptoms suggestive of chronic arthropathy to pediatric rheumatology centers. *Arthritis Rheum* 2006; 55: 373-7.
4. GRAHAME R, BIRD HA, CHILD A: The revised (Brighton 1998) criteria for the diagnosis of benign joint hypermobility syndrome (BJHS). *J Rheumatol* 2000; 27: 1777-9.
5. DEAN AG SK, SOE MM: OpenEpi: Open Source Epidemiologic Statistics for Public Health, Version. www.OpenEpi.com, updated 2013/04/06, accessed 2013/10/20.
6. QURESHI AU, MAALIK A, AHMAD TM: Relationship of joint hypermobility and musculoskeletal problems and frequency of benign joint hypermobility syndrome in children. Journal of Ayub Medical College, Abbottabad: *JAMC*. 2010; 22: 150-4.
7. WYNNE-DAVIES R: Familial joint laxity. *Proc R Soc Med* 1971; 64: 689-90.
8. ARROYO IL, BREWER EJ, GIANNINI EH: Arthritis/arthralgia and hypermobility of the joints in schoolchildren. *J Rheumatol* 1988; 15: 978-80.
9. TOBIAS JH, DEERE K, PALMER S, CLARK EM, CLINCH J: Joint hypermobility is a risk factor for musculoskeletal pain during adolescence: findings of a prospective cohort study. *Arthritis Rheum* 2013; 65: 1107-15.
10. MIKKELSSON M, SALMINEN JJ, KAUTIAINEN H: Joint hypermobility is not a contributing factor to musculoskeletal pain in pre-adolescents. *J Rheumatol* 1996; 23: 1963-7.
11. EL-GARF AK, MAHMOUD GA, MAHGOUB EH: Hypermobility among Egyptian children: prevalence and features. *J Rheumatol* 1998; 25: 1003-5.
12. CLINCH J, DEERE K, SAYERS A *et al*.: Epidemiology of generalized joint laxity (hypermobility) in fourteen-year-old children from the UK: a population-based evaluation. *Arthritis Rheum* 2011; 63: 2819-27.
13. SMITS-ENGELSMAN B, KLERKS M, KIRBY A: Beighton score: a valid measure for generalized hypermobility in children. *J Pediatr* 2011; 158: 119-23.
14. DE INOCENCIO AROCENA J, OCAÑA CASAS I, BENITO ORTIZ L: [Joint hypermobility: prevalence and relationship with musculoskeletal pain]. *An Pediatr* (Barc) 2004; 61: 162-6.
15. HARRIS H, JOSEPH J: Variation in extension of the metacarpo-phalangeal and interphalangeal joint of the thumb. *J Bone Joint Surg Br*1949; 31B: 547-59, illust.
16. CHENG JC, CHAN PS, HUI PW: Joint laxity in children. *J Pediatr Orthop* 1991; 11: 752-6.
17. FORLEO LH, HILARIO MO, PEIXOTO AL, NASPITZ C, GOLDENBERG J: Articular hypermobility in school children in Sao Paulo, Brazil. *J Rheumatol* 1993; 20: 916-7.
18. DECOSTER LC, VAILAS JC, LINDSAY RH, WILLIAMS GR: Prevalence and features of joint hypermobility among adolescent athletes. *Arch Pediatr Adolesc Med* 1997; 151: 989-92.
19. BEIGHTON P, SOLOMON L, SOSKOLNE CL: Articular mobility in an African population. *Ann Rheum Dis* 1973; 32: 413-8.
20. GRAHAME R: Joint hypermobility--clinical aspects. *Proc R Soc Med* 1971; 64: 692-4.
21. GEDALIA A, PRESS J, KLEIN M, BUSKILA D: Joint hypermobility and fibromyalgia in schoolchildren. *Ann Rheum Dis* 1993; 52: 494-6.
22. SPEROTTO F, BALZARIN M, PAROLIN M, MONTEFORTE N, VITTADELLO F, ZULIAN F: Joint hypermobility, growing pain and obesity are mutually exclusive as causes of musculoskeletal pain in schoolchildren. *Clin Exp Rheumatol* 2014; 32: 131-6.
23. DE INOCENCIO AROCENA J, FERNANDEZ MENDEZ MA: [Musculoskeletal pain in pediatric patients. Prevalence and etiology in Primary Care]. *An Esp Pediatr* 1998; 48: 381-4.
24. LEONE V, TORNESE G, ZERIAL M *et al*.: Joint hypermobility and its relationship to musculoskeletal pain in schoolchildren: a cross-sectional study. *Arch Dis Child* 2009; 94: 627-32.
25. QVINDESLAND A, JONSSON H: Articular hypermobility in Icelandic 12-year-olds. *Rheumatology* (Oxford) 1999; 38: 1014-6.
26. MCCLUSKEY G, O'KANE E, HANN D, WEEKES J, ROONEY M: Hypermobility and musculoskeletal pain in children: a systematic review. *Scand J Rheumatol* 2012; 41: 329-38.
27. GEDALIA A, BREWER EJ, JR.: Joint hypermobility in pediatric practice--a review. *J Rheumatol* 1993; 20: 371-4.