

Joint hypermobility and growing pains in school children

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Abstract

Objectives

To study the association between growing pains (GP) and joint hypermobility (HM), children aged 3-9 were examined for the coexistence of HM and GP.

Methods

The study group consisted of 433 children (219 boys, 214 girls; age range 3-9 years) from one public school in Mumbai, India. In the assessment of HM, the Beighton criteria were used. Any child who met $\geq 5/9$ criteria was considered to have HM. Children were considered to have GP if they fulfilled the Petersons criteria, namely the pains were bilateral, intermittent non-articular pains involving the lower limbs; typically occurring during late afternoons or evenings with a normal physical examination and normal laboratory parameters whenever performed. The assessment of HM and GP were carried out independently. Children with bilateral knee hypermobility were also evaluated for the occurrence of GP.

Results

Of the 433 children, 177 (40.8%) were found to have HM and 122 (28.1%) GP; 75 (61.4%) of the 122 with GP had HM and 75 (42.3%) of the 177 with HM had GP. Using chi square statistical analysis, joint hypermobility and GP were found to be highly associated. Knee hypermobility also showed significant statistical association with GP.

Conclusions

This study suggests that there is a strong association between joint hypermobility and GP in schoolchildren. It is possible that joint hypermobility may play a part in the pathogenesis of GP. More studies are needed to establish the clinical significance of this association.

Key words

Growing pains, hypermobility, knee hypermobility.

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Introduction

The entity widely known as 'growing pains' was first described by Marcel Duchamp in 1823 in his treatise *Maladies de la croissance* (1). Though the condition is benign and self-limiting, it remains a common cause for pediatric rheumatology consults with varied explanations offered to parents regarding its causation. Even though the 'growth' theory has been dispelled (2), the name has persisted and the phrase has been exported to English and a dozen European languages. Joint hypermobility (HM) has been speculated as a factor in the pathogenesis (3). We therefore performed a cross sectional study in school aged children to study the association between the two entities, if any.

Materials and methods

The study was performed over a seven-month period (July 2004 to February 2005) in a public school in Mumbai, India. Appropriate ethics committee approvals were obtained before the start of the study.

After due consents, a specially designed questionnaire was sent to parents of all the children in nursery and primary school. The questionnaire enquired about the occurrence of growing pains in their children in the recent past and all responses were corroborated by a personal interview and physical examination of the children. A total of 485 questionnaires were distributed of which 437 were returned completed. Peterson's criteria were used to define growing pains. These criteria include characterization of pains as bilateral, intermittent non-articular pains involving the lower limbs; typically occurring during late afternoons or evenings with a normal physical examination and normal laboratory parameters, whenever performed. (4, 5). Children with obvious neuro-musculo-skeletal disorders or syndromic entities were excluded. A total of 433 children (219 males and 214 females) in the age group 3-9 years were finally enrolled. All the 433 children were screened for hypermobility using the Beighton scoring system by a qualified observer. Access to the questionnaire/parent responses was not available while the children were being

screened for hypermobility. A Beighton score $\geq 5/9$ was considered as positive. To further test the association between local joint hypermobility and the occurrence of GP, we evaluated that subset of children with bilateral knee hypermobility (defined as knee hyperextension more than 10 degrees.) for the existence of GP. Results were analysed using the Chi squared test for statistical significance.

Results

The demographic details of our study population are shown (Fig. 1). Also shown is the distribution of hypermobility and growing pains across the various age groups and the cumulative prevalence in the population studied. There was no significant sex bias in the occurrence of hypermobility or growing pains in our population.

Seventy-five of the 122 (61.4%) children with GP had HM and seventy-five of the 177 (42.3%) children with HM had GP. A 2x2 table was constructed to study the association between the two entities (Table I). The association between joint hypermobility and growing pains was found to be statistically significant. (Chi square = 28.6, $p < 0.0001$). We then evaluated the subset of children who had bilateral knee hyperextensibility and GP. The Chi squared test revealed a significant statistical association between knee hypermobility and GPs (Table II).

Review of the literature

Causation of growing pains

Various theories have been postulated towards the causation and association of the enigmatic entity we recognize as growing pains. Growth was first postulated as a cause of limb pains in 1832 by Duchamp (1). However, the present consensus is that growth plays no role in the development of pains. (5)

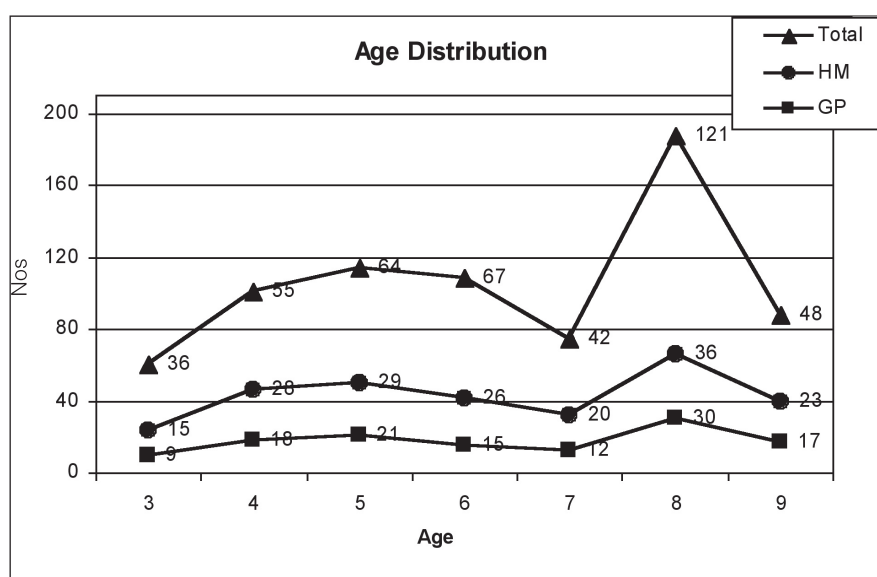
Bennie *et al.* had proposed the *fatigue* theory in 1894 (6). The anatomic theory was postulated by Hawksley in 1938. (7). This theory too lost credence when subsequent studies failed to document consistent physical deformities. Evans *et al.* proposed a possible relationship between pronation (foot posture) and GP (8). Naish

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et al. proposed the idea of fatigue due to overexertion as a possible cause. They also proposed the emotional theory of growing pains. Apley along with Naish had stated that “Physical growth is painful, but emotional growth can hurt like hell”. (9) Thus, Apley (10) and Oster (11) stressed the relationship between GP, headache and abdominal pain in childhood. The latter reported an incidence of 39.2% of headaches and abdominal pains in children with growing pains.

Few children with GP meet the diagnostic criteria for Restless Legs Syndrome (RLS) and a family history of RLS is common in these children. (11). Chervin *et al.* studied the utility of several symptoms and a questionnaire-based scale in the identification of children with periodic leg movements during sleep (PLMS) and concluded that restless legs, growing pains, sleep-maintenance insomnia, unrefreshing sleep, and morning headaches show moderate associations with polysomnographically-defined PLMS. (12).

Hashkes *et al.* studied pain thresholds in children with GP using a Fisher type dolorimeter and concluded that children with GP have more tender points and lower pain thresholds than children without GP indicating that GP may represent a variant of a non-inflammatory pain syndrome in younger children (13). Oberklaid *et al.* compared parents of 183 children identified them as having “pain in arms, legs, or joints during the previous 12 months” with a group of children without pains selected randomly from the rest of a 1605-member community-based cohort in a study of chronic illness and concluded that children with “growing pains” are rated by their parents, but not their teachers, as having different temperamental and behavioral profiles than controls. These data suggest a psychosocial contribution to growing pains akin to that seen with other pain syndromes (14). Roberto *et al.* studied the relation between HM and low bone mineral density and concluded that bone mineral density may be lower in children with joint HM (independent of musculoskeletal pain) and in children with aches and pains (15).



Age	3	4	5	6	7	8	9	Total
GP	9	18	21	15	12	30	17	122
HM	15	28	29	26	20	36	23	177
Total	36	55	64	67	42	121	48	433

Fig. 1. Age based distribution of growing pains and hypermobility.

Table I. Relation between joint hypermobility and growing pains.

	GP	NGP*	total
HM	75	102	177
No HM#	47	209	256
Total	122	311	433

Chi square with Yates correction 28.644 with 1 degree of freedom. Two-tailed *p*-value <0.0001. Fisher's exact test two-tailed *p*-value <0.0001.

*NGP: no growing pains; #no HM: no Hypermobility.

Table II. Knee hypermobility and growing pains.

	GP	NG3	total
Knee sign +ve	37	40	77
Knee sign -ve	85	271	356
	122	311	433

Chi square with Yates correction 17.108 with 1 degree of freedom. Two-tailed *p*-value <0.0001. Fisher's exact test two-tailed *p*-value <0.0001.

Joint hypermobility and musculoskeletal complaints:

Many researchers have reported studies on the association of joint hypermobility and fibromyalgias, soft tissue rheumatism and other musculoskeletal complaints while a few studies have found no correlation between HM and pains. Hudson *et al.*, after an extensive study in adults, suggested that HM was a

major contributing factor in soft tissue rheumatism (16).

Acasuso-Diaz *et al.* analyzed in adults the association of joint HM and fibromyalgia and his study suggested that that joint HM and fibromyalgia are associated and that joint hyperlaxity may play a prominent role in the pathogenesis of pain in fibromyalgia (17). Fitzcharles *et al.* has also discussed the

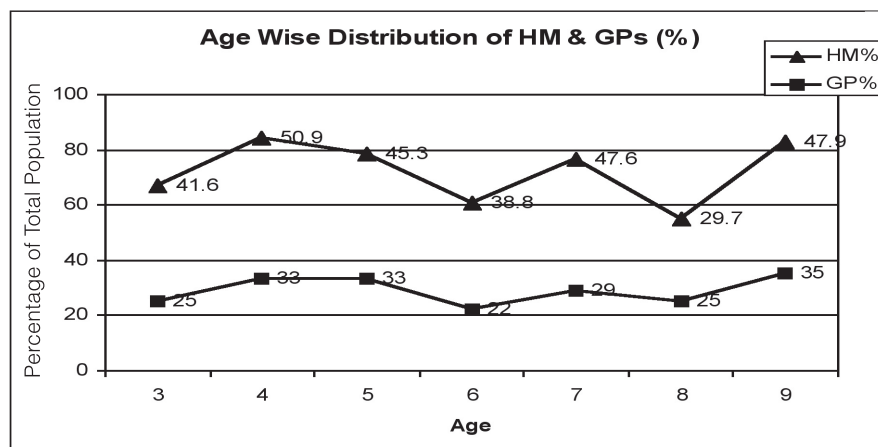


Fig. 2. Age-wise parallel distributions of GP and HM.

association of HM with fibromyalgias (18). Gedalia *et al.* raised the possibility of joint HM to be having a role in the pathogenesis of pain in fibromyalgias in children. Schoolchildren were examined for the coexistence of joint hypermobility and fibromyalgia. The results of the study suggested that there was a strong association between joint hypermobility and fibromyalgia in schoolchildren and a possibility that joint HM may play a part in the pathogenesis of pain in fibromyalgia (19).

Arroyo *et al.* examined 192 normal students aged 5-19 years and found that fifty percent of the hypermobile group had a history of arthralgia, compared to 20% of controls, thereby supporting the possible association between joint HM and the development of articular complaints in children (20).

There have also been divergent reports. Mikkelsen *et al.* studied the prevalence of joint HM and the association of HM with musculoskeletal pain (MSK) in pre-adolescents; Finnish school children in the 3rd and 5th grade, $n=1637$, mean ages 9.8 and 11.8 years, were studied using the Beighton criteria for joint hypermobility (with total score ≥ 6 as a cut-off point for HM), pre-tested questionnaire for musculoskeletal pain, and classification to different pain groups on the basis of painful body area and frequency of pain. He found that disability caused by musculoskeletal pain did not correlate with Beighton total score. The conclusions of the study were that though both Joint HM and MSK are common in pre-adolescents,

hypermobility appears not to be a contributing factor to musculoskeletal pain in pre-adolescents (21). De Inocencio Arocena *et al.* studied the prevalence and relationship with MSK pain in children aged 4-14 years old without organic disease of the locomotor system. He concluded that fifty-five percent of the population studied and 71% of those younger than 8 years old met the criteria for joint hypermobility. In the sample analyzed, the presence of joint HM did not seem to favor the development of skeletal complaints. (22).

Discussion

While HM has often been speculated as causative for growing pains (3), it has been studied to a greater extent for its association with other articular/musculoskeletal complaints as mentioned above. No study has been done till date to study the association of joint hypermobility and growing pains.

Studies to date have recorded the incidence of GP varying from 2.6% to 49.4% (23). This first report on GP from the Asian continent, records its prevalence using Peterson's criteria, in the age group 3-9 years as 28.1%. The prevalence of HM at 40.8% in our population is similar to an earlier study by our group (24). The frequency of GP varied from 22%-33% at the various ages studied and the HM frequency interestingly mirrors the changes seen in that of GP (Fig. 2). We have found a strong statistical association between HM and GP ($p<0.0001$). Our study utilized the Beighton criteria for joint

hypermobility. Other studies utilizing lower extremity HM have been published after our data collection concluded (25). It would be interesting to use such and other scoring systems for HM to analyse the probable association between HM and GP.

The hypermobility syndrome encompasses even those with a single joint signs and related symptoms. We therefore studied the association between the HM and GP using the correlation between bilateral knee hyperextensibility and GP and this aspect of our study too showed a strong association between HM and GP. GP now joins the growing list of musculoskeletal disorders including, soft tissue rheumatism and, fibromyalgia to be associated with HM.

With this strong association it is tempting to speculate a pathogenetic role for HM in the occurrence of GP. If HM does indeed play a pathogenetic role in the development of growing pains the implications are manifold. Firstly, it implies that all children with GP should be screened for HM and if found to be so, then this becomes a plausible explanation to parents and provides a rational basis for physical therapy. Secondly, in the Brighton criteria for BJHS, debate exists on the interchangeable use of benign episodic arthralgia and growing pains as a minor criterion (26). Studies such as this pave the way for GP to be included as a minor criterion when these criteria are validated in children. And last, but not least, with other entities such as anatomic defects, restless legs syndrome and functional, behavioral issues being implicated in the occurrence of this enigmatic entity, it is open to question whether growing pains is a single disorder or a common end point of several factors operating singly or in combination. If so, we too support the use of the alternative term 'benign nocturnal lower limb pains of childhood' (27).

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