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Comparison of joint hypermobility in general and orthopaedic clinic population in south India

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Abstract

Background: Generalised joint hypermobility (GJH) is associated with musculoskeletal symptoms. Beighton score is universally used to measure hypermobility and the cut off score of ≥4 is quoted in literature to define GJH. No data exists on the prevalence of GJH in patients attending orthopaedic outpatients in India.

Materials and methods: The objective of this study was to compare the prevalence of GJH in the general versus orthopaedic patients. 406 patients attending a wellness clinic and 1780 patients attending orthopaedic outpatient clinic in a large private hospital in south India were scored for hypermobility using Beighton score. The mean age of the cohorts attending the wellness clinic and orthopaedic clinic was 33.47± 11.63 years and 36.37± 9.36 years respectively. There were more males than females recruited in the orthopaedic clinic.

Results: The wellness group had significantly higher numbers in the 20 to 39 year age range compared to the orthopaedic group (p value <0.00001). There was a significantly higher proportion of zero Beighton score in the orthopaedic group (p value <0.00001). The proportion of people with Beighton score 4-9 in the wellness and orthopaedic groups were 33% and 3.3% respectively. The proportion of GJH with Beighton score 5-9 was 16% and 2% in the wellness and orthopaedic groups respectively.

Conclusions: This is the only study, to the best of our knowledge, to have attempted to compare GJH prevalence in orthopaedic patients with a control group. The prevalence of GJH is significantly higher in the general population than the orthopaedic outpatients. Beighton score is simple to perform and must be included in the management of every orthopaedic patient.

Keywords: Beighton score; generalised joint hypermobility; musculoskeletal

Introduction

Finkelstein [1] in 1916 first made the association between joint hypermobility and articular symptoms. Kirk et al [2] in 1967 coined the term hypermobility syndrome (HMS) to describe generalized joint hypermobility (GJH) associated with musculoskeletal symptoms. Beighton and Horan [3] in 1969 designed a score to objectively measure hypermobility modifying the earlier Carter and Wilkinson [4] method.

The term hypermobility syndrome (HMS) has now been superseded by benign joint hypermobility syndrome (BJHS) which is defined by Beighton score and Brighton criteria [5]. This diagnosis is often of interest more in Rheumatology than orthopaedic literature.

Prevalence of hypermobility varies by sex (females more common), race (Indians & Africans more than Caucasians) and decreases with age.

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In 2017, the International Consortium on the Ehlers Danlos syndromes (ICEDS) proposed to use the following cut-off Beighton scores for the diagnosis of GJH: ≥6 for pre-pubertal children and adolescents, ≥5 for pubertal men and women up to the age of 50, and ≥4 for those >50 years of age [6].

If hypermobility is observed in less than five joints, the condition may be called localized joint hypermobility (LJH). LJH usually affects one or two smaller or larger joints, may be bilateral, such as in bilateral genu recurvatum. In peripheral joint hypermobility (PJH), the hypermobility is typically limited to the hands and/or feet [7].

Using Beighton cut off score of ≥5, Kumar et al [8], found 20% incidence of GJH from a rheumatology clinic in north India.

Apart from the two studies [8, 11] from rheumatology clinics in north India, there has been a paucity of data on hypermobility in Indian adult population. There has been no comparable study of orthopaedic patients in India or elsewhere. The objective of the present study is to record and compare hypermobility in patients attending wellness clinic and orthopaedic clinic in a 750-bed private health care facility in south India.

Methods

It was decided by the senior author (SG) to perform this study in two parts. The first part involved collecting data from the wellness clinic, where people who do not have any specific medical problem, attend to get their general health checked. This data set is the surrogate for prevalence of joint hypermobility in the general population captured in a hospital setting. The data was collected between March and May 2016 (SJ).

The second part involved collecting data from the orthopaedic out-patient clinic between January 2018 to June 2019 as part of a postgraduate research project (SVK).

Both parts of the study were approved separately by the Institutional Ethics Committee (KFRC/EC/APR/12/2015, KFRC/EC/ 2017/13-03). It was to be conducted in accordance with the ethical principles stated in the declaration of Helsinki, the ICH-ICMR guidelines (ICMR code 2006) with consent forms and patient information leaflets approved by the committee.

All patients between the ages of 15 and 60 were included in the study population. Orthopaedic patients who had fractures, wounds or on postoperative visits who could not undergo assessment by Beighton score were excluded.

Wellness clinic

Beighton scores were collected from a total of 406 people. Participation in the study was voluntary. Each participant was given an information leaflet and signed a consent form. Mean age was 33.47± 11.63 years. There were 198 males (48.8%) and 208 females (51.2%). There were thirteen patients, above the age of 60 (3.2%), who were excluded from the final analysis.

Orthopaedic clinic

Beighton scores were collected from a total of 1780 patients. Patients were recruited from the waiting area before their appointments. Participation in the study was voluntary, each participant was given an information leaflet and signed a consent form. Mean age was 36.37± 9.36 years. There were 975 males (54.8%) and 805 females (45.2%). Age ranges were consolidated into 10-19 years, 20-39 years and 40-59 years. There were 69 patients between 15-19 years of age (3.9%), who were excluded from the final analysis.

Analysis between the two data sets was done by age and Beighton scores, for each gender and cumulatively.

Age grouping was done creating two groups: 20-39 years and 40-59 years. Two cutoff Beighton scores were used - ≥4 and ≥5. This is based on several already published studies using a Beighton score of ≥4 as a marker of clinical laxity and the 2017 guidelines from the International Consortium on the Ehlers Danlos syndromes (ICDES). Analysis based on these ICDES guidelines was not done as the numbers above 50 were quite low, although the raw data has been presented in the tables. A second set of Beighton score analysis was done by separating the zero scores and using a score ≥5 as definition of GJH.

Chi square test with and without Yates correction was used with 2×2 and 2×3 contingency tables to calculate significance with p value of .05 from an online calculator (https://www.socscistatistics.com). All results are reported as a single p value if Yates correction showed no difference.

Results

Gender representation was similar in both groups, although there were fewer females in the orthopaedic group. Scores stratified by score, age range and gender are presented in Table 1 (Wellness clinic) and Table 2 (Orthopaedic clinic).

Table 1: Wellness clinic data with 2 cutoff scores.

Beighton score	*20-29 years*		*30-39 years*		*40-49 years*		*50-59 years*		*60-69 years*	
	M	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*
0-3	53	95	36	16	29	11	13	9	6	4
4-6	26	47	8	13	13	7	12	3	1	2
7-9	1							1		
0	5	4	0	3	3	1	1	1	1	
1-4	56	114	41	21	35	14	21	8	6	6
5-9	19	24	3	5	4	3	3	4		

Table 2: Orthopaedic clinic data with 2 cutoff scores.

Beighton score	*10-19 years*		*20-29 years*		*30-39 years*		*40-49 years*		*50-59 years*	
	M	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*
0-3	26	16	269	119	304	221	309	368	32	58
4-6	18	7	12	8	4	1		5		
7-9		2			1					
0	24	10	225	94	282	188	288	339	32	56
1-4	7	8	50	31	24	33	21	31		2
5-9	14	6	6	2	3	1		3		

Complaints or presumptive diagnosis in the orthopaedic patients were classified according to region, with sprains included in the region involved and only fractures were classified as trauma. Sacroilitis and coccydynia were included in back pain. Shoulder complaints included arm pain, scapular pain and elbows included forearm complaints.

Back pain was noted in 25% males with knee pain as the second major complaint. Knee and back pain were

Table 3: Symptoms in more than one region.

Complaint	*Male (%)*	*Female (%)*	*Total*
Neck pain	73 (7.4)	47 (5.79)	120
Back pain	252 (25.68)	205 (25.28)	457
Pelvis, hip & thigh pain	61 (6.21)	33 (4.07)	94
Knee & leg	190 (19.36)	208 (25.65)	398
Ankle & foot	108 (11)	95 (11.71)	203
Shoulder & arm	99 (10.09)	66 (8.14)	165
Elbow & forearm	50 (5.1)	41 (5.06)	91
Wrist & hand	40 (4.07)	30 (3.70)	70
Trauma	56 (5.7)	31 (3.82)	87
Polyarthalgia	46 (4.69)	62 (7.65)	98
Misc	5 (0.51)	3 (0.37)	8
Blank	-	1	1
Total	981	811	1792

present in 50% females in equal proportion. Trauma was slightly more in males and poly arthralgia was represented more in females. Symptoms in more than one region were recorded in 13 patients (Table 3). One patient did not have the complaint recorded.

The wellness group had significantly higher numbers in the 20 to 39 year age range compared to orthopaedic group (p value <0.00001). There was a significantly higher proportion of zero Beighton score in the orthopaedic group (p value <0.00001). Each gender had similar significance.

The proportion of people with Beighton score 4-9 in wellness and orthopaedic groups was 33% and 3.3% respectively. The proportion of GJH with Beighton score 5-9 was 16% and 2% in the wellness and orthopaedic groups respectively.

By changing the definition of GJH from ≥4 to ≥5, the proportion dropped by half in the wellness group and the change was negligible in the orthopaedic group.

Discussion

Prevalence of GJH in child and adult populations varies from 2%-65% [9]. Such a wide range is due to different cutoff scores used and the effect of age on GJH. Prevalence of GJH was 14.2% in university age population 18-25 years with a Beighton cutoff ≥5 [9]. An Australian [10] population-based study found a Beighton cutoff of ≥4 to have low sensitivity, high specificity and 60% false positive rate and advocated using age and gender specific cutoff rates (higher for female sex). It is our opinion that the cut-off scores suggested by the International Consortium on the Ehlers Danlos syndromes in 2017 is appropriate as it stratifies for age, in the absence of gender specific guidelines.

In our study it ranged between 33%-16% (Wellness clinic) and 3.3%-2% (Orthopaedic clinic) depending on the cutoff Beighton score used. We used two cutoffs to enable comparison with already published literature using ≥4 Beighton cutoff score to define GJH. GJH is significantly higher in the general population than orthopaedic clinic patients. This implies that hypermobility per se may not be the most important causative factor for the various conditions.

Rheumatology clinics in tertiary centres from north India reported GJH prevalence rates from 5.8% (Beighton ≥4, 2486 pts) [11] to 20% (Beighton ≥5, 2050 patients) [8]. Prevalence of Benign Joint Hypermobility syndrome (BJHS) in both studies was approximately half of this. GJH was recorded in 19% (Beighton ≥4) and BJHS 30% of the patients from a British musculoskeletal triage clinic [12]. This is in sharp contrast to our recorded GJH of 3.3% in the orthopaedic clinic (Beighton ≥4).

The low numbers in the orthopaedic clinic when compared to rheumatology clinics in north India could be due to the fact that we had more males than females recruited. Female: male ratio in BJHS was 2.2:1 in the study by Kumar et al [8] with 20% GJH while the study from a military tertiary clinic [11] had a slight preponderance of males with 5.8% GJH. Apart from the gender differences, the mean age of the orthopaedic clinic (36.37± 9.36) was higher than the wellness clinic (33.47± 11.63) in our study and the two rheumatology clinic studies (30± 5.71 [11] & 30± 9.4 [8]). There is no population wide data on hypermobility available. This data if available is very useful to see the effect of hypermobility on the appearance of various conditions if studied longitudinally. In our study there has been an attempt to capture this general population through the wellness clinic.

It is possible that GJH may be higher in patients attending specialized sports clinics dealing with instability. Ramesh et al [13] noted GJH (Beighton ≥6) and knee hyperextension in 42.6% and 78.7% in a cohort of ACL reconstructed patients and 21.5% and 37% respectively in age and gender matched control groups.

Knee joint proprioception is impaired in children-with reduced knee extensor/flexor torque [14] and adults [15] with GJH. Males with GJH (Beighton ≥4) were found to have less isometric muscle strength in both elbow and right knee extensors while females showed no difference with or without GJH [16].

Home based closed kinetic chain and static hamstring exercises over eight weeks improved proprioception in BJHS [17]. A systematic review revealed limited support for exercise-based intervention in BJHS. However insufficient evidence exists regarding the optimal mode, duration and type of exercises [18].

GJH is associated with the risk of musculoskeletal injury [19, 20] and has been reported in professional soccer players [21].

GJH, genu recurvatum and anterior knee laxity is associated with greater knee energy absorption, decreased ankle stiffness in females while decreased ankle stiffness was noticed in males during drop jump experiments, suggesting a possible mechanism for the increased risk of ACL injury in females [22]. Ramesh et al [13] noted the significant association of knee hyperextension and GJH with ACL injury. Kim et al [23] reported better outcomes with bone-patellar tendon-

bone (BPTB) grafts than quadrupled hamstring grafts in patients with GJH (Beighton ≥4) at 2 year follow up. Kim et al [24] found a double bundle quadriceps bone-tendon graft produced less anterior translation than single bundle BPTB graft with no significant difference in functional outcome at two years in GJH (Beighton ≥4).

GJH is associated with multi directional Glenohumeral Instability (GHI) [25]. Ranalletta et al [26] showed Level II evidence (Beighton ≥6) that there is no association with recurrent anterior GHI. Whitehead et al [27] noted a prevalence of 34% GJH with Beighton score ≥4 and poor correlation with shoulder laxity tests. They concluded that a Beighton score ≥4 must not be assumed to be a proxy for GHI.

A Korean [28] study of total knee replacement (TKR) in females with increased laxity revealed a significant difference in the insert thickness and recommended conservative bone cuts. It revealed no difference in clinical outcome at 3 year follow up.

Limitations of study

Non-consecutive recruitment of patients due to inability to participate may be a confounding variable. A well matched, in numbers and gender, control group of patients in wellness clinic would have been ideal but was not possible due to resource constraints. Patients presenting to a private orthopaedic clinic are self-referred and may not have an orthopaedic condition. Wellness clinic patients usually are from the city and its suburbs with its cosmopolitan heterogenous population while orthopaedic patients come from a wider catchment area of the states of Telangana, Karnataka and Andhra Pradesh. Orthopaedic patients, although carefully screened for inclusion in the study, may have lower scores due to pain induced stiffness. Conditions like osteoarthritis/chronic back pain may end up stiffening the joints thereby reducing the score. Only longitudinal studies may pick up the association if any between hypermobility and osteoarthritis (OA).

Conclusions

This study is, to our knowledge, the only study which has a control group. It shows prevalence of GJH to be significantly higher in the general population than orthopaedic clinic patients. Studies with larger patient cohorts or data pooling with multiple studies are needed to show the real prevalence rates in both populations. In children and adolescents presenting with joint pain, Beighton scoring must be included in the workup. Screening is also important in professional athletes to reduce injuries with appropriate training. Beighton score is simple to perform. This plays a major role in clinical decision making- from choosing the appropriate graft in ACL reconstruction to the balancing of knee in TKR and avoid unnecessary anti-inflammatory medication in non-surgical indications. Reporting of outcomes of surgical interventions in published literature must consider the effect of Beighton score to improve our understanding.

Conflicts of interest

Authors declare no conflicts of interest.

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