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Prevalence of Joint Hypermobility in Adolescent Females

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The joint hypermobility syndrome is a condition that characterises joints that are mobile past the range expected for that particular joint. Hypermobility has a significant impact on quality of life of affected individuals. Hypermobile individuals may be more susceptible to musculoskeletal maladies and orthopaedic problems [1] like joint effusions, pain, joint subluxations [2] and alterations in joint proprioception. The objective of this study was to investigate the prevalence of generalized joint hypermobility in school going adolescent females (13-18 years). A cross sectional observational study was undertaken with a sample size of 1827 adolescent females studying in schools of Haryana. Generalised joint hypermobility was assessed using a cut-off Beighton score of ≥5 in accordance with the 2017 International Classification of EDS criteria. Selective joint hypermobility was classified on scores from 1-4/9. Score 0/9 was taken as no hypermobility at all. Adolescent females in the age group of 13-18 years who were not injured were chosen as subjects because young females are more likely to have generalised joint hypermobility. The point prevalence of hypermobility was 28.51 percent whereas prevalence of selective joint mobility was 56.10 percent. 15.59% percent females were not hypermobile according to Beighton's score in 13-18 year old

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females. In this population of youngsters, predominantly women, localized hypermobility was more frequent than generalized hypermobility. The fifth metacarpophalangeal joint is the most commonly affected joint, followed by thumb, elbow, spine and then knee joint. Left side showed more hypermobility than right side. Upper limb joints showed more hyper-mobility than lower limb joints and spine.

Keywords: Beighton score; generalized joint hypermobility; prevalence.

1. INTRODUCTION

Joint hypermobility is a familiar condition but there has been a want of a generally accepted definition [3]. The joint hypermobility syndrome is a condition that characterises joints that are mobile past the range expected for that particular joint [4]. Joint hypermobility emanates due to ligaments [5] and can occur in conjunction with conditions affecting collagen. It may occur in people with a primary inherited disorder affecting connective tissue proteins like osteogenesis imperfecta, Ehler Danlos syndrome or other syndromes, including trisomy 21 and bony dysplasias . Joint Hypermobility Syndrome is an atypical presentation of these disorders and displays some of the features seen in them, albeit to a lesser extent. JHS seems to be a much lighter but a more usual variation [6] This collagen condition is suffused by an increase in extensibility of joints (joint hypermobility) along with musculoskeletal symptoms like joint pain, subluxation or dislocation of joints, tendonitis, bursitis etc. [7]. In most cases hypermobility occurs as an isolated finding but it can be accompanied by musculoskeletal symptoms in the absence of known genetic causes and that may be known as “hypermobility syndrome.” [8] Hypermobile joints are sometimes called loose joints and those who have it may be called double jointed. Not all individuals with hypermobility present with symptoms, some even take advantage of the inherent flexibility which makes it comparatively easy for hypermobile people to perform certain activities like gymnastics, yoga and acrobatics [9,10]. Hypermobile individuals may be more susceptible to musculoskeletal maladies and orthopaedic problems [1] like joint effusions, pain, joint subluxations [2] and alterations in joint proprioception [11].

Hypermobility is a common condition especially in children since connective tissue is not properly developed in children. The prevalence of hypermobility decreases with age, so the relation is inverse. Girls show more hypermobility than boys at any age [12-15] There is also a sizeable difference between various ethnic groups. Epidemiological studies propound that individuals of all races and age groups experience generalised joint hypermobility. Also more prevalence has been demonstrated in Asians and West Africans [16] English Caucasians have been found to be less mobile than Asian Indians. Hand flexibility is also more in Asians than Caucasians [17].

Carter and Wilkinson [18] had first described criteria for the assessment and scoring of joint hypermobility which was modified by Beighton and Horan [19]. These criteria were later revised by Beighton, Solomon & Soskolne (1973) which is the scoring system presently used in epidemiology of joint hypermobility [20]. It takes very little time, is easy to administer and does not require any complex instrument. A simple goniometer is required for measuring range of motion in joints. It involves a series of nine binary joint pliancy tests. The total score lies between 0-9 where higher scores are an indication of greater joint extensibility and scores at higher end of spectrum (5-9) indicate generalized joint laxity. The test has been demonstrated as a valid and reliable test in a number of studies [21-23].

Various studies have used cut off scores of ≥3, ≥4, ≥5or ≥6, with ≥4 being the most commonly used cut off score [20-22] A higher cut off has been recommended for use in children as joint extensibility is more in infants which diminishes through childhood and adolescence [1,2,22,23]

2. MATERIALS AND METHODS

2.1 Data Collection

A cross sectional observational study was undertaken with a sample size of 1827 adolescent females studying in schools of Haryana. The list of schools was obtained and adolescent females were included from schools selected by random number table method by convenience sampling. Adolescent females in the age group of 13-18 years who were not injured were chosen as subjects because young

females are more likely to have generalised joint hypermobility [9,20,24]. Females who were cooperative and were able to follow verbal commands were included in the study while female students with known musculoskeletal complaints, any recent surgery, connective tissue disorders and any neurological disorders were excluded from the study [25,26]. Permission was obtained from school authorities. The procedure of the evaluation and the importance of the study were explained to the Principal and teachers of the school. Permission for carrying out the study in school establishment was obtained from the principal.

Demographic information was obtained such as name, age and gender of the participants. Generalized joint laxity was measured by the Principal investigator using the Beighton 9 point scoring system. Assessment for each joint was done individually. If the fifth metacarpophalangeal joint could be extended >90 degrees, then the joint was scored as hypermobile. For the thumb joint passive apposition to the wrist if possible was scored as hypermobile. Passive knee and elbow extension more than 10 degrees was counted as hypermobile. If both palms could be placed flat on the floor with the knees straight, then the trunk was scored as hypermobile. A recording of scores was done for separate joints and the total score was calculated. A cut off of ≥5 hypermobile joints was taken as the cut off score to define generalized joint laxity, based on the cut off most commonly used in previous studies [27-29]. The subjects were classified as selective joint hypermobility if they scored 1-4/9 and score 0 as no hypermobility. The joint ranges were measured by using a digital goniometer. All the children from each class were screened and assessed on the basis of Beighton's score. The point prevalence of generalized and selective joint hypermobility was calculated as percentage.

3. RESULTS

The current study was conducted on 1827 normal healthy school going adolescent females studying in schools of Haryana in the age group of 13-18 years. Table 1 shows distribution of the population according to age in sub groups of age 13-18 years. Fig. 1 shows the prevalence of Joint Hypermobility with a cut off Beighton score of ≥ 5/9. The point prevalence of hypermobility was 28.51 percent whereas prevalence of selective joint mobility was 56.32 percent. 15.16 percent females were not hypermobile according to Beighton's score in 13-18 year old females (Table 2 and Fig. 2)

Table 1. Age wise population distribution

Age (Years)	Girls (n)
13	286
14	363
15	396
16	377
17	285
18	120

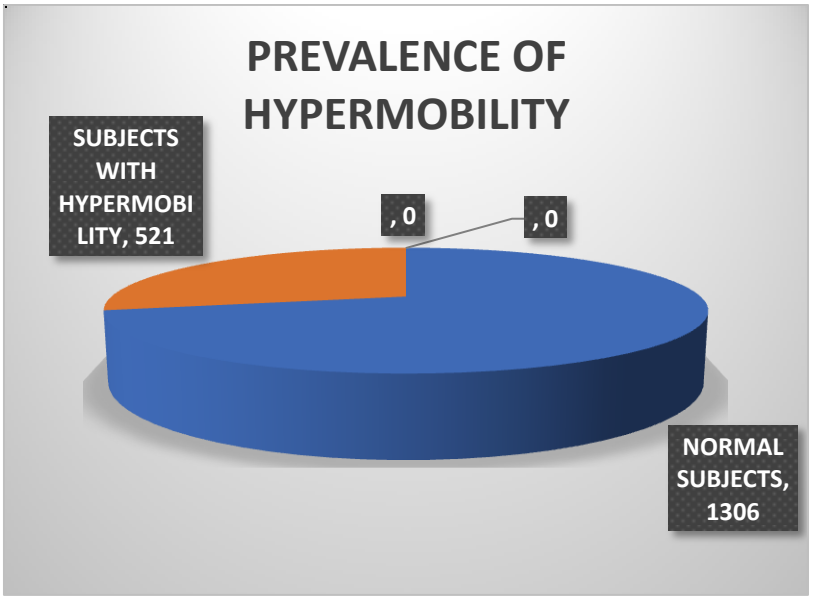

Fig. 1. Of adolescent females

Table 2. Classification with Beighton's score

Classification	Beighton's score	Number of girls
Generalised joint hypermobility	≥5 Out OF 9	521 (28.51%)
Selective Joint hypermobility	1-4 Out OF 9	1025 (56.10%)
Non hypermobile	0 Out OF 9	285 (15.59%)

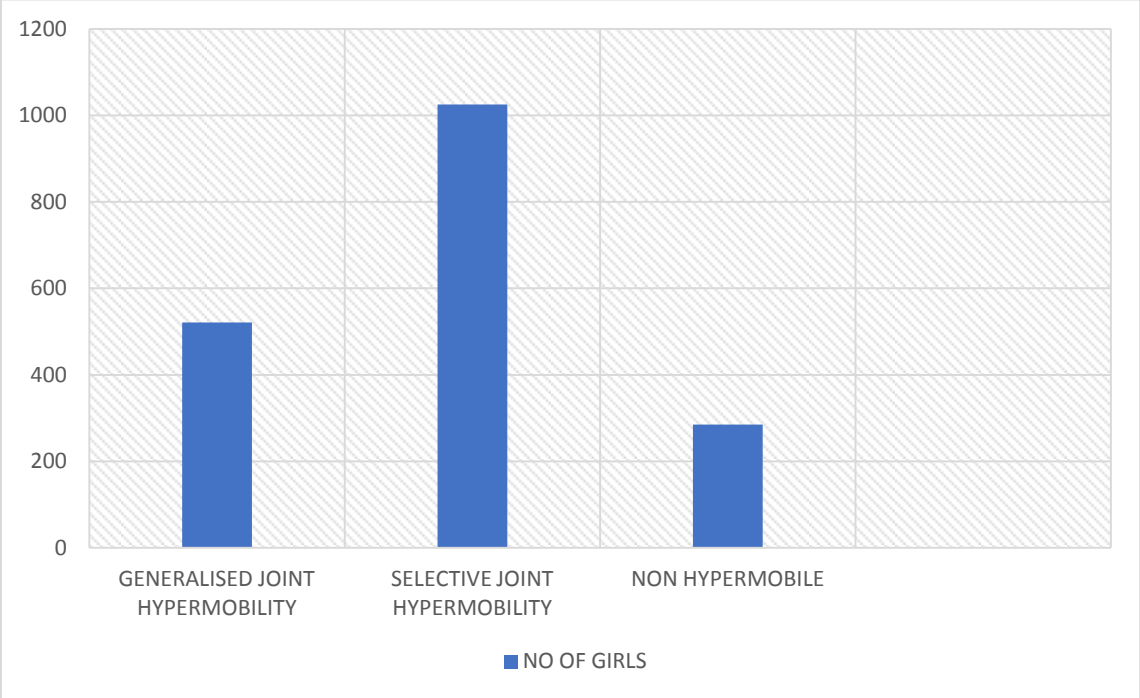

Fig. 2. Graph showing the classification with Beighton's score

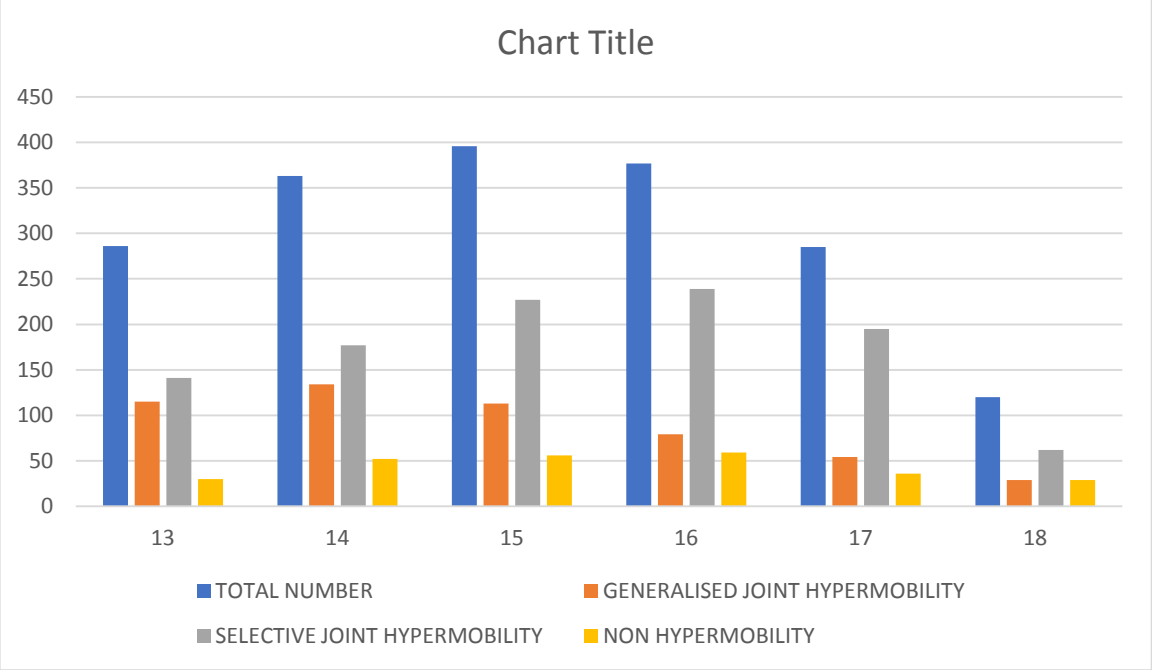

Fig. 3. Graph showing age wise prevalence of joint hypermobility among children

Table 3. Age wise prevalence of joint hypermobility among children

Age (years)	No of females	Generalised joint hypermobility	Selective joint hypermobility	Non hypermobile
13	286	115 (40.20%)	141 (49.30%)	30(10.48%)
14	363	134(36.91%)	177 (48.76%)	52(14.32%)
15	396	113 (28.53%)	227 (57.32%)	59 (14.89%)
16	377	79 (20.95%)	239 (63.39%)	79 (20.95%)
17	285	54 (18.94%)	195 (68.42%)	36 (12.63%)
18	120	29 (24.16%)	62 (51.66%)	29 (24.16%)

Table 3 and Fig. 3 show the age wise prevalence of joint hypermobility among children of age subgroups 13-18 years. Hypermobility decreased with an increase in age. There was unequal distribution of participants in each subgroup.

Point prevalence of hypermobility at each of the 9 sites used in the modified Beighton criteria, based on the full study population at age.

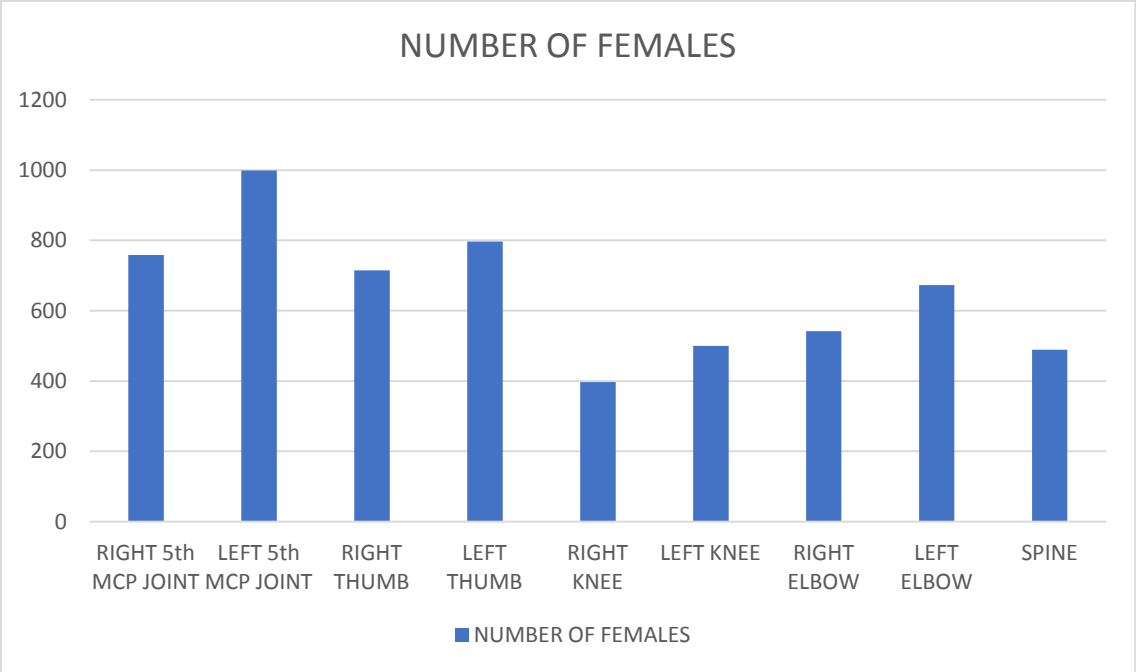

Fig. 4. Graph showing point prevalence of hypermobility at Beighton site

Table 4. Point prevalence of hypermobility at Beighton site

Beighton site	Number of hypermobile joints
Right finger	758
Left finger	999
Right thumb	715
Left thumb	797
Right knee	397
Left knee	500
Right elbow	542
Left elbow	673
Trunk	489

4. DISCUSSION

Child and adult populations have been reported to have prevalence of joint hypermobility in the wide range of 2% to 65% [4,27,30-32]. The varied prevalence may be due to variability in the studied population in terms of age, sex, ethnicity and also, different methods of evaluation and a variety of cut off scores [33]. Children demonstrate asymptomatic joint hypermobility very commonly and still it remains under-recognised and insufficiently managed [15].

No study, to date has been done in North India to find the prevalence of joint hypermobility. So, this study was done to find the prevalence of joint hypermobility in school going adolescent females.

This was the principal study exploring the pervasiveness of generalised joint hypermobility (GJH) in school youngsters from Haryana. No studies have been performed to evaluate the predominance of GJH in Haryana ,India so far. This study has affirmed the assessment that the predominance of GJH relies upon the Beighton score (BS) [17]. The wide scope of commonness appraisals might be credited to strategic contrasts across concentrates as well as genuine contrasts in the predominance of GJH between nations. As a general rule, the affect of this study is as per the past examinations on Western populaces [5,7,11]. The critical impact old enough on the pervasiveness of GJH is commented in greater part of studies [1,2,9,10]. In the current study that was aimed at finding out the prevalence of Generalised and Selective Joint hypermobility in school going adolescent females aged 13-18 years, the total number of participants was 1827. In the present study, the prevalence of generalised joint hypermobility (Beighton's Score≥5/9) is 28.51% and selective joint hypermobility is 56.10%., and non-hypermobile 15.59%. These results correspond with other studies It was also demonstrated that prevalence decreased with increasing age which is in concurrence with other studies. Palm signs were more common with more hypermobility perceived at fingers. It was noticed that left side was more hypermobile than right side. Steady with the discoveries of past examinations, our study provides with some evidence of laterality of hypermobility in school-aged females. This is in concordance with one study [34] and in contrast to another [35]. Lumbar spine was considerably less hypermobile in the studied population which may be attributed to hamstring tightness that in turn may be associated with decreased lumbar flexion range [36-40].

Beighton's scoring system has been criticised for having a slant towards upper extremity indications. The significant prevalence of hand and elbow indications in our population (similar to research from Iceland (38) and Egypt) supports this (39). The symptoms are generally in the lower extremities, yet the indicators are in the upper extremities, creating a incongruity (40). Kirk, Ansell, and Bywaters made the same observation in their seminal work.

5. CONCLUSION

In conclusion, using the cut off of ≥5 hypermobile joints, 591 out of the 1827 school-age adolescent females (13-18 years) in the present study would currently receive a diagnosis of generalized joint laxity. Prevalence of joint hypermobility in adolescent females comes out to be 32.34%. The fifth metacarpophalangeal joint is the most commonly affected joint, followed by thumb , elbow, spine and then knee joint. Left side showed more hypermobility than right side. Upper limb joints showed more hyper-mobility than lower limb joints and spine.

ETHICAL APPROVAL

The research protocol was approved by Institutional Ethics Committee of SGT University, Gurgaon, India. Data collection followed all ethical norms relevant to the survey of school going adolescent female population.

CONSENT

Parental consent and child's assent in writing were obtained for all measurements.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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