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GENDER-RELATED DIFFERENCE IN JOINT HYPERMOBILITY AMONG SCHOOL-AGED CHILDREN: A DESCRIPTIVE STUDY

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Abstract

Joint hypermobility is common among school-aged children and it may progressively lead to joint pain and developmental delay. Identifying joint hypermobility in school-aged children would facilitate the monitoring of early changes and planning for early rehabilitative intervention. This study aimed to describe gender-related difference in joint hypermobility among school-aged children. A descriptive study was conducted in an elementary school in Surakarta, Central Java, Indonesia. The study subjects were 261 students aged 6 to 12 years selected randomly. The study variables were gender and joint hypermobility. Beighton scale was used to assess joint hypermobility score. Gender-related difference in joint hypermobility among school-aged children was tested using t-test. The results of ≥4 points on Beighton scale was observed in 157 of 261 school-aged children (60.2%). Mean of Beighton score in female children (Mean= 3.87; SD= 0.19) was higher than male chidren (Mean= 4.15; SD= 1.82), but it was statistically non-significant (p= 0.256). It can conclude that there is no difference between gender in joint hypermobility among school-aged children. The need for joint hypermobility screening tests in elementary school children is highlighted.

Keywords: Beighton score; joint hypermobility; school-aged children

Introduction

Hypermobility describes an objective measure of a joint moving passively or actively beyond normal physiological limits around axes of motion (Castori et al., 2017). An example is hyperextension or recurvatum of the knee. The proposed multidimensional causes of joint hypermobility include bone morphology/shape seen in humeral and femoral torsion, increased surface area for articulation (Molleson, 2018), and dysplastic or excessively compliant passive restraints to physiological joint motion (Kanazawa et al., 2017; Nicholson et al., 2022).

Epidemiological studies report a large variation in hypermobility prevalence, depending on the clinical assessment method, cutoff score used, population, physical fitness, age, sex, and race (Remvig et al., 2007). The prevalence of joint hypermobility has been reported as ranging from 5% to 40% in children and 10% to 20% in adults (Quatman et al., 2008). Beyond the early years, children typically present with greater joint mobility than adults (Nicholson et al., 2022). Generalized joint hypermobility is more common among West Africans, females, and the non-dominant side than among other ethnicities, males, and the dominant side, respectively (Wolf et al., 2011; Kwon et al., 2013).

The purpose of this study was to investigate the frequency distribution of gender-related difference in joint hypermobility among university school-aged children 6 to 12 years.

Methods

1. Study design

   The present study employed a descriptive study. This study was carried out in an elementary school in Surakarta, Central Java, in December 2021.

2. Subjects

   Subjects for this study were 261 elementary school students (ages 6–12 years) from an elementary school in Surakarta. Children who had edema and contractures in the joint area, had muscle weakness i.e drop hand or erb palsy, or post joint dislocation <4 months were excluded from the data analysis.

3. Data collection

   The classification of hypermobility was established using the instructed self-examination recorded by three trained observers, using the criteria of Beighton. Based on the Beighton scoring system, a person gets 1 score for doing each of these moves (the first four moves will be performed on both sides and will score 1 for each side): (1) passive extension of the fifth metacarpo-phalangeal joint past 90°, (2) passive opposition of the thumb to the forearm, (3) hyperextension of the elbow joint past 10°, (4) hyperextension of the knee joint past 10°, and (5) trunk flexion allowing the palms to be placed flat on the floor (Sobhani-Eraghi et al., 2020). The maximum score was 9. Beighton score ≥ 4 was the most widely reported in the literature as the most frequent cutoff point of joint hypermobility (Artigues-Cano and Bird, 2014; Sanches et al., 2015).

4. Statistical analysis

   All statistical analyses were performed using STATA ver. 13.0 for Windows. First, a descriptive analysis was performed. Differences in the Beighton scores joint hypermobility between the gender groups were tested for significance using the t-test. Statistical significance was set at a p= 0.050.

5. Research ethics

   The participants of this study were school-aged children who agreed to participate by signing the Terms of Informed Consent. This study obtained health research institutional ethics committee approval from Dr. Moewardi General Hospital, Surakarta, Central Java, Indonesia (1,105/XII/HREC/2021).

Results

Table 1. Frequency distribution of sample characteristics

Sample characteristics	n	%
Gender		
Female	117	44.8
Male	144	55.2
Age		
6 years	16	6.1

7 years	55	21.1
8 years	46	17.6
9 years	45	17.2
10 years	48	18.4
11 years	42	14.9
12 years	12	4.6
Beighton score		
Normal (Beighton score <3)	104	39.8
Hypermobile (Beighton score ≥4)	157	60.2

A total of 144 male children (55.2%) indicated a higher percentage than 117 female children (44.8%) in groups. The highest percentage of age group was 10 years (48 children, 18.4%). Joint hypermobility was observed in 157 (60.2%) school-aged children (Table 1).

Table 2. Joint hypermobility distribution by location

Joint location	Female		Male	
	n	%	n	%
Trunk	52	50.49	51	49.51
Elbow	36	31.89	77	68.11
Knee	3	3.33	87	96.67
Thumb	145	53.70	125	46.30
Finger	252	52.94	224	47.06

The locations of the joint hypermobility and their respective frequencies and distributions by gender are shown in Table 2. This study describes the localized signs of hypermobility predominated on the hands (finger and thumb) and secondarily on the elbows, trunk, and knee.

Table 3. Independent t test of gender-related difference in joint hypermobility (by Beighton score) among school-aged children

Groups	n	Mean	SD	p
Male	117	3.87	0.19	0.256
Female	144	4.15	1.82	

An independent test found that Beighton score in female children (Mean= 4.15; SD= 1.82) was higher than male children (Mean= 3.87; SD= 0.19), but it was statistically non-significant (p= 0.256).

Discussion

The primary objective of this study was to estimate the frequency of hypermobility among school-aged children and compare gender-related difference in joint hypermobility among school-aged children using Beighton scale. Our study revealed that Beighton score in female children is higher than male children, but it was statistically non-significant.

A previous study by Sudaryanto et al. (2022) also reported similar results that male children had lower risk to joint hypermobility than female children but it was statistically non-significant (OR= 0.89; 95% CI= 0.53 to 1.48; p= 0.656). Studies reported joint hypermobility in children between 6 and 15 years old ranged from 8.8% to 64.6% (Sobhani-Eraghi et al., 2020).

Jansson et al. (2004) conducted a study among 1,845 Swedish children aged 9 to 15 years and confirmed the presence of hypermobility greater among girls than boys. As reported in previous studies, among 500 students with age ranged from 8 to 17 years in Rawalpindi and Islamabad, Pakistan, 33.5% joint hypermobility are more common in female children than male (29%) (Seçkin et al., 2005).

Joint hypermobility is more prevalent in females than in males. Although similar age-related trends of joint hypermobility have been reported between sexes, the decrease in joint mobility after puberty is usually more pronounced among males (Cahill et al., 2020; Nicholson et al., 2021). Proposed explanations for these sex-related differences include, but are not limited to, hormonal, anatomical, and neuromuscular differences (Jansson et al., 2004; Graf et al., 2019).

Although this study showed that the Beighton score was higher in the female group, the results were not significant. A meta analysis carried out by Sobhani-Eraghi et al. (2020) declared that significant gender- and age-related differences in the incidence of joint hypermobility in children and adolescents are strongly influenced by the characteristics of the population under evaluation, race, geographical area, sample size and method of study design, instrument and measurement process, and genetic tendencies.

Antonio and Magalhaes (2018) described the frequency of joint hypermobility in young people (age 18 to 25 years) population. Their study found that joint hypermobility was predominantly occurred in women and localized hypermobility was more frequent than generalized hypermobility.

Another study investigated by Sirajudeen et al. (2020) reported that the prevalence of generalized joint hypermobility was higher among females (16.8%) than among males (13.4%), but the difference was not statistically significant. The elbow joints (17.2%) were the most common hypermobile joints and the trunk (0.7%) was the least involved.

A study among Korean female adolescents and adults described the presence of generalized hypermobility in 50% of respondents, 59% in female adolescents and 36.5% in adult women. Significant differences of localized hypermobility in the thumb and 5th finger were found in both groups (Kwon et al., 2013).

Conclusion

This recent study concluded that joint hypermobility is more common in female than male school-aged children. Quatman et al. (2008) concluded that female experience an increase in generalized joint laxity following the onset of puberty, while male do not demonstrate a significant change in laxity with puberty. People with excessive laxity arthritis are more prone to injuries such as sprains, dislocations, joint displacement caused by too intense exercise, and even daily activities. Rapid detection of hypermobility of joints are important to be able to most effectively counteract the negative effects (Czaprowski et al., 2012; Cattalini et al., 2015).

Author Contributions

Wahyu Tri Sudaryanto contributed to the conception and design of the research, drafted the original research proposal, and corrected the critical revision of the manuscript for important intellectual content; Dylla Ramadhani Putri contributed to the data collection and measured the

joint hypermobility using Beighton scale; and Ika Yuli Ayuningrum contributed to the acquisition, analysis, interpretation of data analysis, and write the manuscript. All the authors approved this study finally.

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Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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