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Joint Hypermobility in Patients with Chondromalcia Patellae

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Abstract: Background: Joint hypermobility significantly influences the development of chondromalacia patellae, an illness distinguished by the softening and degradation of cartilage on the kneecap. Aim: This study contributed to enroll and analyze clinical outcomes of Joint hypermobility impact on patients with chondromalcia patellae. Patients and methods: We collected data from 92 patients with chondromalacia patellae and analyzed functional outcomes related to joint hypermobility in hospitals in Najaf, Iraq, between January 2023 and January 2024. A sample of patients, comprising 27 males and 65 females, was recruited. We performed several measurements related to joint mobility, assessed the severity of chondromalacia patellae, and evaluated functional outcomes related to knee pain. Results: Our outcomes found that most groups that participated had (21 – 25) years with 44.57% of patients, almost the cause of joint hypermobility was increased joint mobility included 64.13% and anterior knee pain was the most symptom prevalent in outcomes, include 48.91% of total patients. The most locations of the knee with chondromalacia was right with 25%, left with 29.35%, and both with 45.65%, the severity of chondromalacia patella with grade 4 had 45.65%, and with grade 3 had 30.43%. The functional outcomes of Knee Pain showed that decreased degrees of mobility function at patients, where Swelling (53.6 ± 6.7), pain (45.6 ± 8.8), flexion deficiency (32.5 ± 6.2), and walking (39.7 ± 7.5). Conclusion: Our study indicates that possible hyperextensibility of the knee joint as a contributing factor in the pathogenesis of chondromalacia patellae.

Keywords:. Joint Hypermobility, Symptoms; Mobility Score, Anterior Knee Pain, and Chondromalcia Patellae.

INTRODUCTION

Joint hypermobility (HA) has been defined as the increase of joint mobility above the ranges considered normal among the general population associated with musculoskeletal symptoms (Gullo, T.R., and Golightly, Y.M 2019; Gullo, T.R., and Golightly, Y.M 2019). The morbidity of HA varies according to the age and sex of those studied (Callahan, L.F., and Cleveland, R.J 2011). In Germany, it reaches 11% of adolescents, with a female predominance and no significant variations in skin color (Ali, A., and Andrzejowski, P. 2020).

Joint hypermobility, also known as joint elasticity or hyperlaxity, is characterized by an increase in the amplitude of joint movement in normal individuals (Clinch, J., and Deere, K 2011). It is due to a hereditary alteration of the collagen fibers, which causes not only the joint tissues to be affected but also damage to the rest of the tissues (Shiue, K.Y., and Cleveland, R.J 2020).

Sometimes, this hyperlaxity is accompanied by discomfort in the locomotor system, and then we define this status as "Joint hyperlaxity syndrome (Luder, G., and Aeberli, D 2022).

Most people with hyperlaxity do not experience any discomfort due to their increased elasticity, and only 5-10% of people with hyperlaxity have any disability (Boudreau, P.A., and Steiman, I 2020; Macri, E.M., and Runhaar, J 2022; Malek, S., and Reinhold, E.J 2021; Remvig, L., and Jensen, D.V 2007). Hyperlaxity is accompanied by articular and/or extra-articular clinical manifestations; it constitutes joint hyperlaxity syndrome (HLS) or benign joint hypermobility syndrome, defined by the revised criteria, in which a value of 4/9 indicates hyperlaxity. Its recognition in the pediatric population has increased over time, and the common complaints associated with it are pain and fatigue (Castori, M., and Tinkle, B 2014; Juul-Kristensen, B., and Schmedling, K 2017; Grahame, R., and Bird, H.A 2000).

PATIENTS AND METHODS

a. Study Design

We conducted a cross-sectional study to evaluate joint hypermobility in patients with chondromalacia patellae. This study included 92 patients with chondromalacia patellae and hypermobility, comprising 29.35% males and 70.65% females, admitted to the Rheumatology Department at hospitals in Najaf, Iraq, during the follow-up period from January 2023 to January 2024. Data and patient outcomes were analyzed using SPSS 22.0 software.

Inclusion and exclusion criteria included patients aged 10–30 years, smokers, obese patients, and those with other comorbidities, some of which were genetically linked to the disease. Alcohol users, patients younger than 10 years or older than 30 years, pregnant patients, patients with inflammatory arthropathy, and patients with hemolysis were excluded.

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b. Data Collection

Demographic and clinical data were collected for patients, including age, gender, BMI, diet, other comorbidities, smoking status, medical history, genetics, socio-economic status, and socio-cultural background. The data included the prevalence and symptoms of chondromalacia patellae in patients diagnosed by MRI, which categorizes knee pain on a 0-5 scale. Patient symptoms included anterior knee pain, swelling and effusion, patellofemoral crepitus, and quadriceps wasting. Furthermore, pathological causes related to joint hypermobility were identified, including increased joint motion, patellofemoral instability, and biomechanical abnormalities. As previously mentioned, all patients were diagnosed by MRI with chondromalacia patellae in the knee, with the affected sites (right knee, left knee, and both). The dominant leg length was determined, with patients divided into longer (half-1 cm), shorter (half-1 cm), and equal.

C. Questionnaires:

The severity of chondromalacia patellae was measured for participating patients diagnosed by MRI to determine the extent of cartilage damage. Scores were provided using the Outerbridge Grading Scale, which classifies the condition into five different grades based on the severity of the condition (grade 0, representing normal cartilage; grade 1, representing cartilage softening and swelling; grade 2, showing cartilage cracks or fissures; grade 3, representing complete loss of cartilage thickness; and grade 4, indicating significant bone damage). Hypermobility and its severity were also assessed using the Beighton Scale, which scores range from 0 to 9, with higher scores representing more severe mobility. Furthermore, we conducted a questionnaire to evaluate the functional outcomes of patients with patellofemoral pain, especially those suffering from patellofemoral pain. All patients underwent a questionnaire using the 13-question Anterior Knee Pain Scale (AKPS), with scores ranging from 0 to 100, where 100 represents the greatest functional score indicating improvement in the knee, while 0 represents the lowest score, which represents poor knee movement.

RESULTS

In this study, our outcomes showed the most patients who participated were in age (21 – 25) got 41 cases, males with 27 cases and females with 70.65%, obesity had 25%, and smokers had 28.26% of total patients.

Table 1: Demographic and clinical characteristics of patients.

Categories	Variables	No. of patients, {n = 92}	Percentage,%
Age			
	10 – 15	4	4.35%
	16 – 20	35	38.04%
	21 – 25	41	44.57%
	26 - 30	12	13.04%
Sex			
	Males	27	29.35%
	Females	65	70.65%
Body mass index, {kg/m2}			
	Underweight	3	3.26%
	Normal weight	52	56.52%
	Overweight	14	15.22%
	Obesity	23	25.0%
Diet type			
	Normal	63	68.48%
	Poor	29	31.52%
Comorbidities			
	No	66	71.74%
	Hypertension	7	7.61%
	Diabetes	5	5.43%
	Asthma	3	3.26%
	Anemia	4	4.35%
	Others	2	2.17%
Smoking status			

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	Present	26	28.26%
	Absent	66	71.74%
Family history of illness			
	Yes	36	39.13%
	No	56	60.87%
Marital status			
	Single	28	30.43%
	Married	58	63.04%
	Divorced	6	6.52%
Education status			
	Primary	17	18.48%
	Secondary	24	26.09%
	University	51	55.43%
Economic status, $			
	< 500	45	48.91%
	500 – 800	37	40.22%
	> 800	10	10.87%

This study clarified the causes and symptoms of 92 patients. Our outcomes found that the main cause related to joint hypermobility was increased joint mobility of 59 patients, followed by patellofemoral instability of 22 patients, while the most symptom related to chondromalacia Patellae was anterior knee pain of 45 patients, and swelling and effusion of 21 patients.

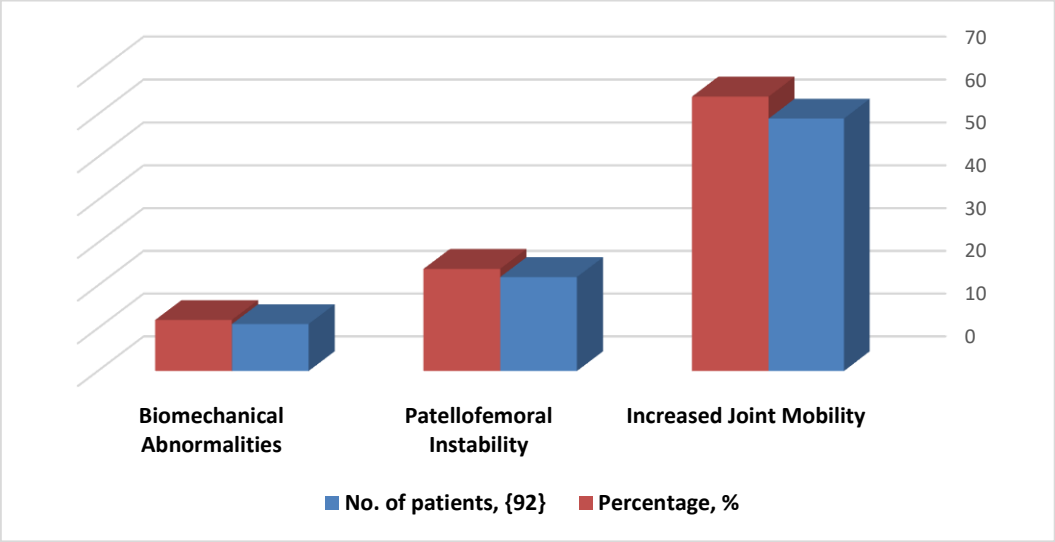

Figure 1: Distribution of chondromalcia patellae over all participated patients.

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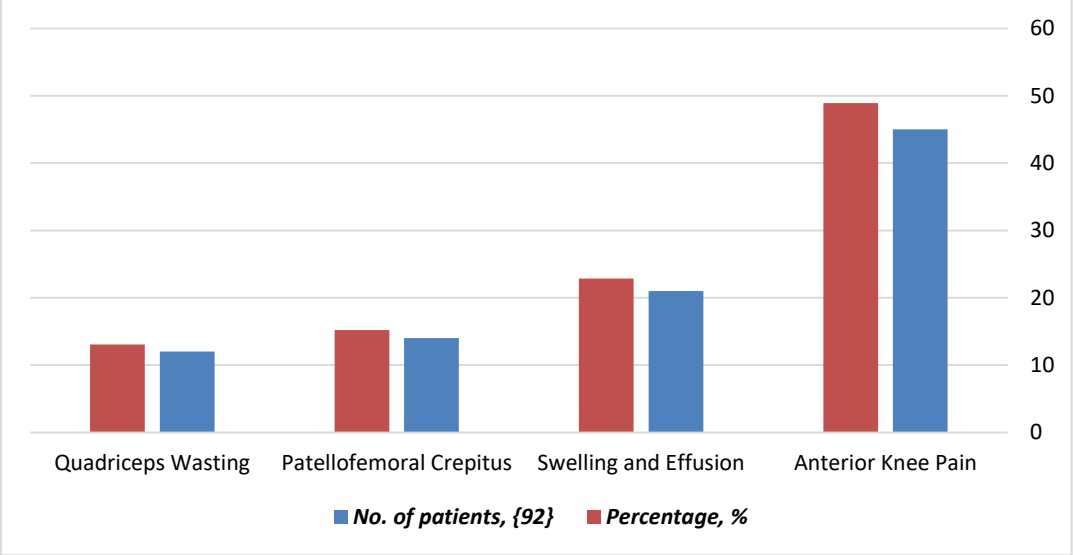

Figure 2: Distribution of symptoms related to Chondromalacia Patellae over participated patients.

Furthermore, all patients were examined of knee injuries, where the right knee of 23 patients, the left of 27 patients, and both of 42 patients almost injured in longer leg with eight patients, shorter of 17 patients, equal of 67 patients.

Table 2: Define locations of the knee with chondromalacia.

Locations	No. of patients, {n = 92}	Percentage,%
Right	23	25.00%
Left	27	29.35%
Both	42	45.65%

Table 3: Determining dominant leg length of patients.

Items	No. of patients, {n = 92}	Percentage,%
Longer (1/2 - 1 cm)	8	8.70%
Shorter (1/2 - 1 cm)	17	18.48%
Equal	67	72.83%

Table 4: Identify quadriceps muscle wasting.

Knee with chondromalacia	quadriceps muscle wasting	
	Right	**Left**
Right (23)	20 (21.74%)	-
Left (27)	-	19 (20.65%)
Both (42)	24 (26.09%)	29 (31.52%)

Table 5: Frequency distribution severity of chondromalacia patella using Outerbridge grading scale.

Grades	No. of patients, (n = 92)	Percentage, (%)
Grade 0	0	0%
Grade 1	6	6.52%
Grade 2	42	45.65%
Grade 3	28	30.43%
Grade 4	42	17.39%

In addition, of all patients diagnosed by MRI technique, where determining the severity of chondromalacia patella, 42 patients had negatively functional outcomes with grade 2, and 28 with grade 3, where 67% of patients had increased joint hypermobility in scores within 7 – 9, while other patients had joint hypermobility bellow seven scores.

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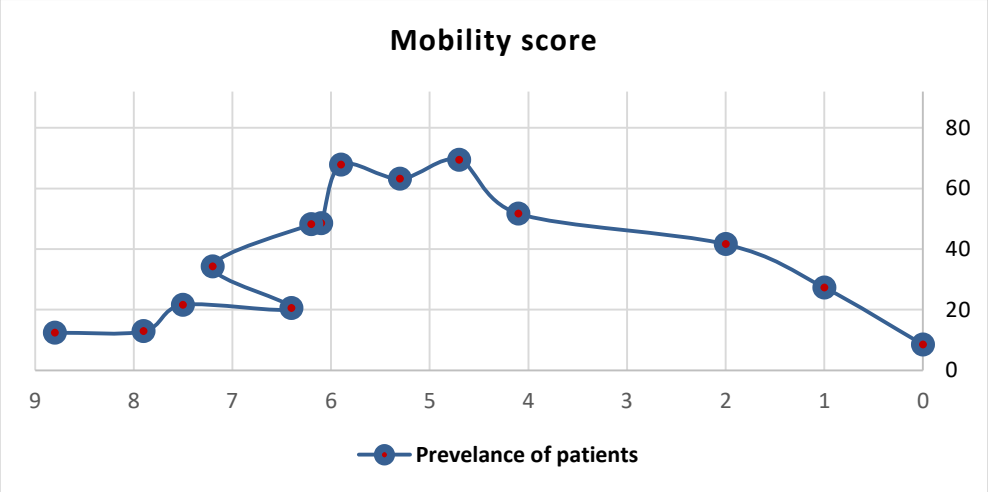

Figure 3: Distribution of the prevalence of mobility scores on all patients by Beighton score.

Table 6: Assessment of functional outcomes of Knee Pain related to patients using Kujala Anterior Knee Pain Scale.

Items	Scores
LIMP	62.5 ± 14.2
SUPPORT	45.7 ± 8.2
WALKING	39.7 ± 7.5
STAIRS	54.1 ± 9.5
SQUATTING	57.3 ± 6.6
RUNNING	66.5 ± 5.9
JUMPING	52.4 ± 6.2
PROLONGED SITTING WITH THE KNEES FLEXED	48.4 ± 4.4
PAIN	45.6 ± 8.8
SWELLING	53.6 ± 6.7
ABNORMAL PAINFUL KNEECAP (PATELLAR) MOVEMENTS (SUBLUXATIONS)	40.4 ± 10.6
ATROPHY OF THIGH	48.5 ± 5.3
FLEXION DEFICIENCY	32.5 ± 6.2

DISCUSSION

The present study has demonstrated a significant association between generalized joint laxity and chondromalacia patellae, indicative of a notable increase in hypermobile knees among knees with chondromalacia patellae, include weight to the earlier impression that knee hypermobility could be a factor in the pathogenesis of chondromalacia patellae.

Joint hypermobility could contribute to increased patellofemoral instability and its related problems (Fatoye, F., and Palmer, S 2009; Russek, L.N 2000). Some studies elucidate the clinical implications of joint hypermobility concerning chondromalacia patellae, with particular emphasis on instability and functional outcomes (Hakim, A.J., and Grahame, R. "A 2003; Cameron, K.L., and Duffey, M.L 2010). Despite the expanded instability risk, yet still, studies indicated concerns relating to the functional nature of other considerations (Carter, C., and Wilkinson, J 1964).

This condition was more prevalent in the long leg than in the short leg. The data were weakly significant, though this finding fits the long-leg arthropathy paradigm. A study conducted in the USA (Castori, M., and Tinkle, B 2017). showed leg-length inequality present in 84% of patients, with the involved side being the shorter.

The outcome of our study indicates that 13.04% of patients suffering from unilateral chondromalacia patellae had quadriceps muscle wasting, whereas the German study (Centers for Disease Control and Prevention 2018).stated that quadriceps were wasted in 45% of chondromalacia patients.

In patients with hypermobility, this is supported by the evidence, which states more joint complaints in 21 patients with swelling and effusion, 45 patients

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with anterior knee pain, and 14 patients with patellofemoral crepitus (Chustecka, Z 2004).

Joint mobility was enhanced in 64.13% of the patients, while a different study established that 37.4% of the patients studied exhibited non-normal appearing joints among those patients who had chondromalacia (Clinch, J., and Deere, K 2011). Some studies agreed that 22% of chondromalacia patients had effusion. On the other hand, although joint hypermobility is frequently associated with more musculoskeletal problems, some studies propose that not all hypermobile patients suffer significant pain and disability, necessitating individual assessment and management strategies (Collinge, R., and Simmonds, J.V 2009; Day, H., and Koutedakis, Y 2011; Didia, B.C., and Dapper, V.D.B 2022; El-Garf, A.K., and Mahmoud, G.A 1998; El-Metwally, A., and Salminen, J.J 2004 Engelbert, R.H., and Bank, R.A 2003).

CONCLUSION

The Beighton scores (indicative of hypermobility) discovered in our study indicate that quality of life concerning functional outcomes of knee pain for patients with chondromalacia patellae, where hypermobility serves as a risk factor, diminishes functional results.

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