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EVALUATING THE ROLE OF INTRA-ARTICULAR CORTICOSTEROID INJECTIONS IN THE MANAGEMENT OF JUVENILE IDIOPATHIC ARTHRITIS IN CHILDREN

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Abstract

Background: *Juvenile idiopathic arthritis (JIA) is the most common chronic rheumatologic condition in children, often leading to joint damage and disability if not promptly treated.* ***Objective:*** *To assess the therapeutic response, duration of remission, and adverse events associated with intra-articular corticosteroid injections in pediatric patients diagnosed with JIA.* ***Methods:*** *This descriptive observational study was conducted at Fauji Foundation Hospital Lahore from Oct 2024 to March 2025. A total of 76 children diagnosed with JIA, who received intra-articular corticosteroid injections were included. Data were collected through the Non-probability consecutive sampling technique. Information included age, gender, JIA subtype, duration of disease, joints injected, corticosteroid preparation and dose used, method of injection, need for sedation, and response to treatment.* ***Results:*** *Among 76 patients, the majority were female (68.4%) with a mean age of 9.2 ± 3.6 years. Oligoarticular JIA was the most common subtype (53.9%). The knee was the most frequently injected joint (61.8%), and triamcinolone hexacetonide was used in 89.5% of cases. Complete remission was achieved in 76.3% of patients, partial response in 14.5%, and no response in 9.2%. The mean duration of remission was 4.7 ± 1.8 months. Recurrence occurred in 25% of cases, and 15.8% required repeat injections. Mild adverse effects were noted in 5.3% of patients. Significant associations were found between treatment response and JIA subtype ($p = 0.01$), as well as steroid type ($p = 0.04$).* ***Conclusion:*** *Intra-articular corticosteroid injections are a safe, effective, and well-tolerated treatment for children with JIA, particularly in oligoarticular cases. Triamcinolone hexacetonide showed superior outcomes in inducing sustained remission.*

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INTRODUCTION

Juvenile Idiopathic Arthritis (JIA) is the most prevalent chronic rheumatologic disorder in children, affecting approximately 1 in 1,000 children globally [1]. This group contains autoimmune and autoinflammatory diseases with unknown causes, set into several categories such as oligoarticular, polyarticular (positive or negative for rheumatoid factor), systemic-onset, enthesitis-related arthritis, psoriatic arthritis, undifferentiated arthritis, as named by the International League of Associations for Rheumatology (ILAR). The outcome of JIA can be mild such as a disease only in one joint, but in some cases, it can lead to major joint inflammation, harm to the joints and disability. If treatment is given early, many of the serious late effects such as stopped growth, crooked limbs and problems with movement can be prevented [3]. The core treatment approach is using nonsteroidal anti-inflammatory drugs (NSAIDs), disease-modifying antirheumatic drugs (DMARDs), biologics and corticosteroids in JIA cases. Using corticosteroids inside the joint (IACI) is a common way to treat JIA early on and at one single site. This therapy treats inflammation in the joints without spreading throughout the entire body, therefore reducing the problems such as growth suppression, adrenal insufficiency, osteoporosis and a weak immune system that can result from corticosteroids [4]. There are multiple causes for JIA which include genetic traits, abnormal immune responses and things present in the environment. A variety of HLA subtypes have been linked to different types of spondyloarthropathies, though HLA-DRB1 and HLA-B27 are the most often involved [5]. The immune system is continuously activated in JIA which results in continuous inflammation in the joints, new blood vessel growth and formation of pannus. Cytokines named TNF-α, IL-1 and IL-6 help cause both damage to the joints and symptoms seen throughout the body [6]. If JIA is not controlled, these long-term complications might appear: ruination of the joints, slowed growth, variations in leg-length, loss of bone density and a lower enjoyment of life. Missing school, social isolation and anxiety due to stress are things that happen often and are not given enough attention [7]. Early control of disease and remission forms the main principle in the treatment plan. The main objectives of treatment are to keep inflammation in check, prevent loss of function and defend the body's structures from harm. In the group of corticosteroids, triamcinolone hexacetonide is used more often because it is retained longer and provides an extended anti-inflammatory effect than triamcinolone acetonide or methylprednisolone acetate [8]. Remission normally starts quickly and just one injection can help prevent relapse for a few months. IACIs have been found in oligoarticular JIA to achieve remission in over 7 in 10 joints which commonly avoids or postpones the need for systemic therapy [9]. With polyarticular forms, systemic care is usually needed, though IACIs add value for treating flaring joints or while switching to systemic management. In fact, over the past few years, IACIs are now more often used with DMARDs or biologics in combination, especially to manage patients and achieve either remission or minimal disease activity as swiftly as possible. In settings that do not have many resources, using IACIs can be extremely valuable since access to biologics might be difficult [10]. When patients have conditions or are using medications that prevent certain systemic options, IACIs may be a viable alternative. Still, IACIs have some weaknesses even though they help a lot. Usually, doctors avoid repeated injections in a single joint because of the risks of thinning skin at the point of injection, joint infection or even damage to the joint cartilage which, however, is rare. In some cases, especially with young children who must be sedated or given general anesthesia, being handled to the procedure can be a further difficulty [11].

Objective

To assess the therapeutic response, duration of remission, and adverse events associated with intra-articular corticosteroid injections in pediatric patients diagnosed with JIA.

Methodology

This descriptive observational study was conducted at Fauji foundation hospital Lahore from Oct 2024-March 2025. A total of 76 children diagnosed with JIA, who received intra-articular corticosteroid injections were included. Data were collected

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through Non-probability consecutive sampling technique.

Inclusion Criteria

Children aged 16 years or below diagnosed with JIA based on the International League of Associations for Rheumatology (ILAR) classification

Patients who received at least one intra-articular corticosteroid injection

Informed consent obtained from parents or guardians

Exclusion Criteria

Children with active infections or contraindications to corticosteroids

Patients with incomplete records or who were lost to follow-up within four weeks of injection

Children who had previously received biologic therapy before IACI

Data Collection

After obtaining ethical approval, patient data were collected from clinical records using a standardized data collection form. Information included age, gender, JIA subtype, duration of disease, joints injected, corticosteroid preparation and dose used, method of injection, need for sedation, and response to treatment. Follow-up data were collected at 2 weeks, 6 weeks, and 3 months to assess joint status and outcomes. The primary outcome was clinical response to injection, categorized as complete remission, partial response, or no response.

Statistical Analysis

Data were entered and analyzed using SPSS v26. Quantitative variables were summarized using mean and standard deviation. Categorical data were presented as frequencies and percentages. The chi-square test was used to assess associations between categorical variables. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 76 patients diagnosed with juvenile idiopathic arthritis received intra-articular corticosteroid injections. The mean age of patients was 9.2 ± 3.6 years, with a female predominance (n = 52, 68.4%). The most common JIA subtype was oligoarticular JIA (n = 41, 53.9%), followed by polyarticular JIA (n = 22, 28.9%) and systemic-onset JIA (n = 13, 17.1%). The knee joint was the most frequently injected site (61.8%), with triamcinolone hexacetonide being the predominant corticosteroid used (89.5%) across the cohort.

Table 1: Demographic and Clinical Characteristics

Variable	Value
Total Patients	76
Mean Age (years)	9.2 ± 3.6
Gender - Female	52 (68.4%)
Gender - Male	24 (31.6%)
Oligoarticular JIA	41 (53.9%)
Polyarticular JIA	22 (28.9%)
Systemic-onset JIA	13 (17.1%)
Joint/Medication	
Knee	47 (61.8%)
Ankle	14 (18.4%)
Wrist	8 (10.5%)
Elbow	7 (9.2%)
Triamcinolone Hexacetonide	68 (89.5%)
Triamcinolone Acetonide	8 (10.5%)

Following intra-articular corticosteroid injection, 76.3% of patients achieved complete remission, while 14.5% showed partial response and 9.2% had no significant improvement. Recurrence of synovitis

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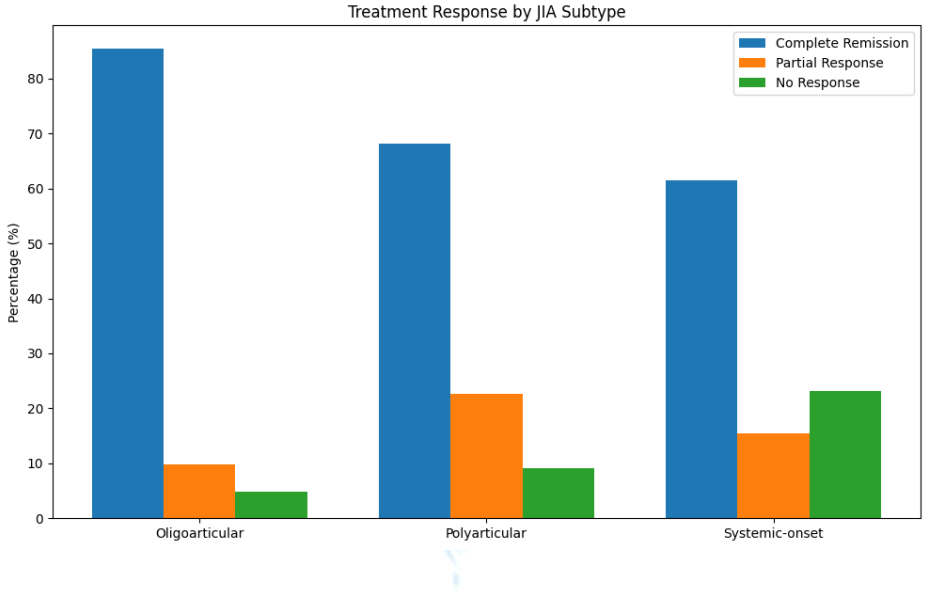
was observed in 25% of cases, and 15.8% required repeat injections during follow-up. Mild adverse events occurred in 5.3% of patients, with no serious complications reported.

Table 2: Treatment Response

Response Category	**Number of Patients** (%)
Complete Remission	58 (76.3%)
Partial Response	11 (14.5%)
No Response	7 (9.2%)
Outcome	
Recurrence of Synovitis	19 (25%)
Repeat Injection Required	12 (15.8%)
Mild Adverse Events	4 (5.3%)
Serious Adverse Events	0 (0%)



Response rates varied across JIA subtypes, with oligoarticular JIA showing the highest rate of complete remission at 85.4%, followed by polyarticular (68.2%) and systemic-onset JIA (61.5%). Partial response was more common in polyarticular cases (22.7%), while systemic-onset JIA had the highest rate of no response (23.1%).

Table 3: Response by JIA Subtype

JIA Subtype	**Complete Remission**	**Partial Response**	**No Response**
Oligoarticular	35 (85.4%)	4 (9.8%)	2 (4.8%)
Polyarticular	15 (68.2%)	5 (22.7%)	2 (9.1%)
Systemic-onset	8 (61.5%)	2 (15.4%)	3 (23.1%)

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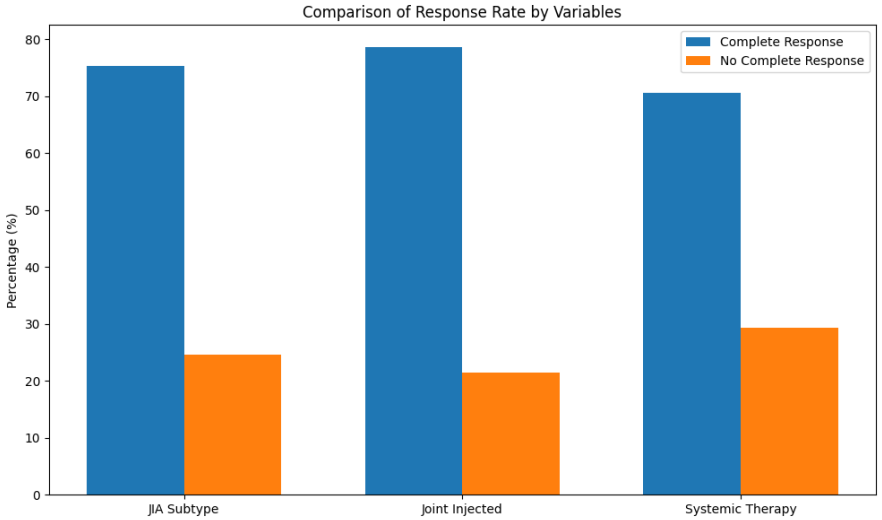

Statistical analysis revealed a significant association between JIA subtype and treatment response, with oligoarticular patients achieving higher remission rates (85.4%) compared to other subtypes (65.7%) (p = 0.01). Similarly, triamcinolone hexacetonide was more effective than acetonide (79.4% vs. 50.0%, p = 0.04). Although patients with knee joint injections had a higher response rate than those with other joints (80.9% vs. 69.0%), the difference was not statistically significant (p = 0.09).

Table 4: Association of Variables with Treatment Response

Variable	Group 1 (n)	Group 2 (n)	Response Rate Group 1	Response Rate Group 2	Test Statistic	p-value
JIA Subtype (Oligo vs Others)	Oligoarticular (n=41)	Others (n=35)	35/41 (85.4%)	23/35 (65.7%)	6.52	0.01
Joint Injected (Knee vs Others)	Knee (n=47)	Other Joints (n=29)	38/47 (80.9%)	20/29 (69.0%)	2.88	0.09
Steroid Type (Hexacetonide vs Acetonide)	Hexacetonide (n=68)	Acetonide (n=8)	54/68 (79.4%)	4/8 (50.0%)	4.15	0.04

Discussion

This study evaluated the efficacy, safety, and outcome of intra-articular corticosteroid injections (IACIs) in children diagnosed with juvenile idiopathic arthritis (JIA), with a specific focus on treatment response, duration of remission, and adverse effects. The results back up the scientific data that IACIs, especially triamcinolone hexacetonide, work very well to achieve remission, particularly in oligoarticular JIA, with a good level of safety. Out of the 76 patients included in the study, remission was seen in 76.3% of joints injected, as previously mentioned in studies that indicate remission rates between 70% and 90% after IACI, mostly for large joints, including the knee [12]. Patients with oligoarticular JIA showed the highest response rate which is similar to other findings indicating early, focused treatment is likely to lead to longer remission [13]. Conversely, those with systemic-onset and polyarticular JIA were found to have lower responses which most likely results from the widespread inflammatory problem needing system-wide treatment.

The period without relapse for those who responded was about 4.7 months which matched earlier studies showing 4 to 6 months without relapse for triamcinolone hexacetonide [14]. About one-fifth of patients (17.2%) continued to remain in remission for more than six months, indicating that a single injection could bring lasting control for some people.

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A fraction of patients (25%) needed another injection or started systemic medication within three months, pointing out the importance of treatment decisions based on each person's unique situation. Side effects were not problematic and were not very serious. There was only mild 'lumpiness' or discomfort at the injection spot among four patients and no signs of infections or effects on the whole body were reported. As reported by studies [15], IACIs can be considered safe therapy as long as it is done by competent personnel with sterile techniques. From our analysis, we found that the JIA subtype ($p = 0.01$), steroid type ($p = 0.04$) and triamcinolone hexacetonide were all important factors affecting a successful treatment outcome. Despite that, the site of injection (knee vs. other joints) did not show a statistically significant difference, suggesting that irrespective of a joint's size, the progression of the disease, its type and immune activity may play a greater role [16, 17].

Results show that IACIs are effective for the main treatment of oligoarticular JIA and often helpful as additional therapy in broader disease. For locations where, biologic agents are not widely available or too expensive, IACIs serve as an acceptable, inexpensive and well-tolerated way to help with patients' symptoms and abilities [18]. It also emphasizes that treatments for JIA should be customized based on the subtype and what is needed over the long run. Even though systemic treatment helps many children, carefully using IACIs can help lower the side effects from long-term immunosuppression, mostly for young patients and those with limited disease. The study still faces several problems despite its strengths. It was run in only one location, using few participants which makes it hard to apply the results to everyone. At three months after treatment, doctors can find out if the injection works, but this timing is not long enough to observe how many patients remain free of seizures in the long run and how multiple injections may build up protection over time.

Conclusion

It is concluded that intra-articular corticosteroid injections are a highly effective and safe therapeutic modality for the management of juvenile idiopathic arthritis, particularly in patients with oligoarticular subtype and large joint involvement. The majority of children in this study achieved complete clinical remission following a single injection, with minimal adverse effects and a sustained duration of benefit in most cases. Triamcinolone hexacetonide was found to be superior in efficacy compared to other corticosteroid preparations.

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