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# Age-Related Features of Juvenile Arthritis Onset in Children and Their Impact on Clinical Course and Disease Prognosis

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**Abstract** To evaluate how the age of onset affects the clinical course and prognosis of juvenile arthritis (JA) in children. A total of 112 children with JA were divided into groups based on age at disease onset: early (1–4 years), middle (5–9 years), and late (10–16 years). Clinical features, disease activity, and outcomes were compared. Early-onset JA was associated with more severe disease, systemic symptoms, and poorer prognosis. Later-onset cases showed milder forms and better treatment response. Age at onset correlated with disease duration, joint involvement, and functional outcome ($p<0.05$). Age at disease onset significantly influences the clinical course and prognosis of JA, highlighting the need for age-specific management approaches.

**Keywords** Juvenile arthritis, Age of onset, Children, Prognosis, Clinical course

## 1. Introduction

Juvenile arthritis (JA) is a group of chronic inflammatory joint diseases that occur in children under 16 years of age and are characterized by differences in clinical course, laboratory signs, and outcomes [1,2]. According to ILAR (International League of Associations for Rheumatology), juvenile arthritis is divided into several subtypes, differing in the number of affected joints, the presence of systemic manifestations, and serological markers [3].

In recent years, there has been an increase in the incidence of juvenile arthritis, which requires a more detailed study of the factors influencing its course and prognosis [4,5]. One such factor is the age of disease manifestation, which, according to a number of studies, can determine not only the nature of clinical manifestations but also the severity of the inflammatory process, the risk of disability development, and the effectiveness of therapy [6,7].

Children with JIA debuting early (until 4 years old) are more likely to have systemic forms of the disease, polysutural lesions, persistent activity of the inflammatory process, and a higher probability of adverse outcomes [8,9]. At the same time, adolescents with a later onset of the disease more often exhibit oligoarthritic forms with a favorable course and high sensitivity to basic therapy [10].

Despite the existence of separate publications dedicated to the influence of disease onset age on the course of JIA, the issues of prognosis remain incompletely studied, especially in the context of stratification by age subgroups and disease forms [11,12]. Considering this, a comprehensive study aimed at identifying the relationship between the age of onset of juvenile arthritis and the main characteristics of its clinical course and outcome is becoming relevant.

**The purpose of the study** consists to assess the influence of the age of manifestation of juvenile arthritis in children on the clinical course of the disease and the prognosis of its outcomes.

## 2. Material and Methods

The study was conducted on the basis of the pediatric rheumatology department in the period from 2022 to 2024. The study included 112 children diagnosed with juvenile arthritis (JA) according to the classification criteria of ILAR (International League of Associations for Rheumatology, 2001).

Inclusion criteria: children aged 1 to 16 years; first-time diagnosis of JIA; absence of concomitant systemic autoimmune diseases (ulcer, vasculitis, etc.).

Exclusion criteria: previously administered immunosuppressive therapy; presence of severe somatic or infectious diseases; inaccuracy of anamnestic data.

Patient grouping: to assess the influence of age on the manifestation of JIA, all patients were divided into three groups:

Group I - early onset (1-4 years) - 38 patients;

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Group II - average age of onset (5-9 years) - 40 patients;
Group III - late onset (10-16 years) - 34 patients.

Research methods:

Clinical method: collection of anamneses (including the age of onset, duration of the disease before diagnosis); assessment of pain syndrome, morning stiffness, number of affected joints; JADAS-27 (Juvenile Arthritis Disease Activity Score) scale for measuring disease activity.

Laboratory studies: total blood count (TBC), ESR, C-reactive protein (CRP); rheumatoid factor (RF), antinuclear antibodies (ANA), HLA-B27.

Instrumental methods: ultrasound examination of joints (ultrasound); radiography and MRI of joints (if necessary); functional assessment according to the CHAQ (Childhood Health Assessment Questionnaire) scale.

Evaluation of results: duration of remission; the need for therapeutic escalation; disability registration (group registration).

Statistical processing: Data processing was performed using the SPSS Statistics v.25.0 software package. To assess the differences between the groups, descriptive statistics methods, Student's t-test, Pearson's $\chi 2$-test, and ANOVA were used. Differences at $p < 0.05$ were considered statistically significant. To analyze the correlation between debut age and clinical parameters, Spearman and Pearson correlation coefficients were used.

## 3. Results and Analyses

A total of 112 children with newly diagnosed juvenile arthritis (JA) were included in the study. The mean age at the time of examination was 8.3 ± 2.7 years, with 68 girls (60.7%) and 44 boys (39.3%). Patients were stratified into three groups according to the age of disease onset:

- Group I (early onset, 1–4 years): 38 patients (33.9%)
- Group II (middle childhood onset, 5–9 years): 40 patients (35.7%)
- Group III (late onset, 10–16 years): 34 patients (30.4%)

1. Clinical Characteristics by Age of Onset. Children in Group I showed a higher frequency of systemic arthritis (34.2%) and polyarthritis (47.4%). In contrast, Group III had predominantly oligoarticular forms (55.9%) with milder clinical presentation. Prolonged morning stiffness (>30 minutes) was noted in 79% of children in Group I versus 41% in Group III ($p < 0.01$). Fever, hepatosplenomegaly, and serositis were significantly more common in early-onset patients ($p < 0.001$).

**Table 1.** Clinical forms of JA by age at onset

| Clinical Form | Group I (1–4 yrs) | Group II (5–9 yrs) | Group III (10–16 yrs) | p-value |
|---|---|---|---|---|
| Oligoarthritis | 10 (26.3%) | 18 (45.0%) | 19 (55.9%) | <0.05 |
| Polyarthritis | 18 (47.4%) | 13 (32.5%) | 9 (26.5%) | <0.05 |
| Systemic arthritis | 13 (34.2%) | 6 (15.0%) | 4 (11.8%) | <0.01 |

2. Laboratory Markers of Inflammation. Erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were significantly higher in Group I compared to older age groups.

**Table 2.** Inflammatory Marker (C-reactive protein – CRP)

| Group | CRP (mg/L), mean ± SD | p-value (vs Group I) |
|---|---|---|
| Group I (1–4 yrs) | 34.5 ± 9.2 | – |
| Group II (5–9 yrs) | 23.1 ± 6.7 | <0.01 |
| Group III (10–16 yrs) | 18.6 ± 4.9 | <0.01 |

Positive rheumatoid factor (RF) was more common in Group III (20.6%), while ANA-positivity was most frequent in polyarticular forms across all age groups, especially in girls ($p < 0.05$).

3. Imaging and Joint Damage Progression. Musculoskeletal ultrasound and MRI revealed that children with early-onset JA had significantly more joint effusions, synovial hypertrophy, and erosive changes by the 12-month follow-up ($p < 0.05$). MRI in Group I often showed early erosive changes in wrist and ankle joints. The radiographic progression score (RPS) was significantly higher in Group I (mean score: 4.2 ± 1.1) compared to Group III (1.7 ± 0.6) ($p < 0.001$).

4. Functional Outcomes (CHAQ scores)

Assessment using the Childhood Health Assessment Questionnaire (CHAQ) showed that Group I had the highest functional impairment:

**Table 3.** Functional Outcomes (CHAQ Scores)

| Group | CHAQ Score (mean ± SD) | Functional Class II–III (%) | p-value |
|---|---|---|---|
| Group I | 1.6 ± 0.3 | 28.9% | <0.05 |
| Group II | 1.1 ± 0.4 | 17.5% | <0.05 |
| Group III | 0.9 ± 0.2 | 8.8% | <0.05 |

Functional class II–III disability (WHO criteria) was diagnosed in 28.9% of early-onset patients vs 8.8% in Group III ($p < 0.01$).

5. Treatment Response and Prognosis

Complete clinical remission within 12 months of therapy was achieved in:

**Table 4.** Remission and Therapy Escalation

| Group | Remission within 12 Months (%) | Biologic Therapy Required (%) | p-value |
|---|---|---|---|
| Group I | 39.4% | 52.6% | <0.01 |
| Group II | 60.0% | 27.5% | <0.01 |
| Group III | 73.5% | 20.6% | <0.01 |

Steroid dependence and frequency of disease flares were significantly higher in younger children, indicating a more aggressive disease course.

6. Correlation Analysis

A significant inverse correlation was found between age at disease onset and:

- CHAQ functional impairment score ($r = –0.48$, $p < 0.01$)
- Radiographic progression score ($r = –0.52$, $p < 0.01$)

A positive correlation was observed between age at onset and:

- Probability of remission ($r = 0.44$, $p < 0.01$)
- Treatment responsiveness ($r = 0.37$, $p < 0.05$)

## 4. Conclusions

Early-onset JA is associated with higher inflammatory activity, more aggressive systemic forms, higher risk of joint damage and disability, and lower treatment response. Later-onset JA shows milder clinical features, better response to therapy, and more favorable long-term outcomes. Age at onset is a reliable prognostic marker and should be considered in treatment stratification.

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