

# Correlation between Physical Function, Health Related Quality of Life and Disease Activity in Juvenile Idiopathic Arthritis Patients Attending Suez Canal University Hospital

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## Abstract

**Background:** Juvenile idiopathic arthritis (JIA) is the most common inflammatory autoimmune rheumatic disease in children. It leads to impairments in physical function and health related quality of life. Functional ability and good physical function are important elements in evaluation of treatment efficacy and disease control. **Objectives:** To evaluate the correlation between physical function and health related quality of life with disease activity in juvenile idiopathic arthritis. **Methods:** Thirty-four children diagnosed with JIA based on the International League Against Rheumatism (ILAR) Criteria. They had a clinical and laboratory assessment as well as an evaluation of their disease activity using the juvenile arthritis disease activity score (JADAS 27 ESR), in addition to the Juvenile Arthritis Multidimensional Assessment Report (JAMAR) for functional evaluation and health-related quality of life (HRQoL). **Results:** A significant moderate correlation ( $P$  value  $< 0.05$ ) was seen between JADAS 27 ESR and both physical function and HRQoL. All patients with low disease activity had impaired physical function and HRQoL. There was a moderate correlation between active joint count and HRQoL and physical function in JIA patients ( $r = 0.43$ ,  $r = 0.65$  respectively). Physical function and HRQoL were moderately correlated with ESR ( $r = 0.44$ ,  $r = 0.4$  respectively). There was a negative correlation between Hemoglobin (Hb) and HRQoL, ( $r = -0.37$ ,  $p$  value  $= 0.02$ ). **Conclusion:** The study's findings emphasize the significance of measuring HRQoL and physical function as a significant part of clinical evaluation of JIA patients.

**Key words:** Juvenile idiopathic arthritis, Physical function, Health related quality of life

## Introduction

The most common inflammatory autoimmune rheumatic disease in children is juvenile idiopathic arthritis. It frequently results in childhood disabilities. Children under the age of sixteen are affected, and it encompasses

all types of arthritis with an unknown cause that last six weeks or more <sup>(1)</sup>.

Juvenile idiopathic arthritis leads to significant complications that include fatigue, recurrent pain in the joints and restricted range of motion with deformities, growth abnormalities, and impaired physical function. These

drawbacks cause many health impairments and limitations <sup>(2)</sup>.

The assessment of emotional, functional, and physical state in relation to health is known as health-related quality of life (HRQOL). In the clinical assessment process for JIA patients, this is a crucial part <sup>(3)</sup>.

When managing JIA patients, functional capacity with good physical function are crucial components, and assessing these aspects is essential for determining the effectiveness of treatment and control of the disease <sup>(4)</sup>.

This study aimed to evaluate the physical function and health-related quality of life of patients with juvenile idiopathic arthritis, as well as the correlation with disease activity.

## Methods

The study was conducted at the Physical Medicine, Rheumatology and Rehabilitation Department, Suez Canal University Hospital, Ismailia city, Egypt.

## Patients

Thirty-four patients diagnosed with JIA based on the ILAR criteria were included in the study.

### Inclusion criteria

The ILAR Criteria were used to diagnose JIA patients <sup>(5)</sup>.

**Oligoarticular arthritis:** defined as the involvement of four or lesser joints in the initial six months of the disease.

**Polyarticular arthritis:** defined as the involvement of more than 4 joints and divided into two groups rheumatoid factor positive and rheumatoid factor negative.

### Exclusion criteria

Other connective tissue diseases.

## Controls

This was composed of 34 healthy children with an age younger than 16 years, attending the hospital with their parents who agreed to enroll their children in the study.

## Clinical assessment

A. A comprehensive clinical examination and a full history taking were performed on each participant. We evaluated tenderness, swelling, and restricted range of motion in each joint. A joint's swelling or restricted range of motion combined with pain and tenderness was referred to as an active joint.

B. Patients were evaluated for disease activity using the juvenile arthritis disease activity score 27 ESR (JADAS 27 ESR).

C. Laboratory testing for JIA patients included the complete blood count (CBC), erythrocyte sedimentation rate (ESR), rheumatoid factor (RF), and antinuclear antibody (ANA).

D. To evaluate each patient's functional status and HRQoL, the Arabic version of the Juvenile Arthritis Multidimensional Assessment Report (JAMAR) was used. A patient copy was used if the child can read; if not, a parent copy <sup>(6)</sup> was utilized. It consisted of <sup>(7)</sup>:

**1. Physical function assessment (PF) (15 items):** The child's performance on each test is rated in the following ways: "0" denotes no difficulty, "1" some difficulty, "2" much difficulty, and "3" inability to perform. The score was not applicable if the child's age, other than JIA, prevented them from answering the question or if they were unable to

complete the assignment. Three components make up the total PF score, which has a range of 0 to 45: PF of lower limbs, PF of hand and wrist, and PF of upper segment, each with a score between 0 and 15. More disability is indicated by higher scores.

**2. Health related quality of life (HRQoL)** was measured using a ten-item scale that combines a total score with five items from each of the Psychosocial Health (PsH) and Physical Health (PhH) subscales. Concerning the previous month, the four-point Likert response is as follows: "never" (score = 0), "sometimes" (score = 1), "most of the time" (score = 2), and "all the time" (score = 3). The parent version of the questionnaire featured a 'not applicable' column to indicate items that were unanswerable due to developmental immaturity. Higher values indicate worse HRQoL. The overall HRQoL score ranged from 0 to 30.

### Statistical analysis:

For analysis, data was entered into SPSS version 23.0, the Statistical Package for the Social Sciences. For continuous variables, descriptive statistics were presented as mean  $\pm$  SD and range; for categorical variables, they were expressed as absolute frequencies and percentages. P value for significant results will be  $<0.05$ . Clinical indicators were correlated using Spearman's rank statistics. When correlations were  $> 0.7$ ,  $0.4-0.7$ , or  $< 0.4$ , respectively, they were classified as high, moderate, or poor. Comparison between means by paired t test.

## Results

The study included 34 JIA patients and 34 healthy controls. The Polyarticular subtype accounted for 64.7% of the total JIA patients, whereas the oligoarticular subtype represented 35.3%. The duration of the disease ranged from 0 to 10 years. The mean duration of disease was  $4.2 \pm 2.7$  years. Seventy-three percent of the JIA cases were females and 27% were males. Sixty-four percent of the controls were females and 35.3% were males.

The JIA patients' mean age was  $12.19 \pm 2.6$  years, whereas it was  $11.7 \pm 2.2$  years in the control group. Between the two age groups, there was no statistically significant difference (p value = 0.16).

The BMI of the patients was  $21 \pm 4.3$  and varied from 13.5 to 36.6 whereas the BMI of the healthy control group was between 13 and 23, with a mean of  $18.12 \pm 1.8$ . The BMI of the patients was significantly higher (p value = 0.001) than among the healthy control group.

There were significant differences in number of active joints between the polyarticular and oligoarticular subtypes of JIA ( $P = 0.04$ ) and there was a significant difference in JADAS 27 ESR between polyarticular and oligoarticular subtypes ( $P = 0.03$ ).

Five patients had Rheumatoid factor positive Polyarticular JIA. Antinuclear antibody was positive in only 3 cases of the JIA patients. Twenty-eight patients were on non-biologic DMARDs, and 16 patients were receiving steroids. Only 6 patients were on biologic treatment. Eleven individuals showed moderate disease activity, 8 had low disease activity, and 15 had high disease activity.

Patients' characteristics are shown in table (1)

<b>Table 1. Patient characteristics</b>		
<b>Patient characteristic</b>	<b>Range</b>	<b>Mean <math>\pm</math> SD</b>
<b>Age</b>	4.5-15	12.19 $\pm$ 2.6
<b>Disease duration</b>	0-10	4.2 $\pm$ 2.7
<b>BMI</b>	13.5- 36.6	21 $\pm$ 4.3
<b>F:M ratio</b>	2.7:1	
<b>Hb</b>	9.4 - 13.7	11.8 $\pm$ 1.1
<b>TLC</b>	3-17.9	7.4 $\pm$ 2.6
<b>PLT</b>	201 - 525	317 $\pm$ 77.4
<b>ESR</b>	2 - 100	33.7 $\pm$ 24.8
<b>RF, number</b>	5	
<b>ANA, number</b>	3	
<b>Active joint count, range</b>	0 - 16	
<b>JADAS 27 ESR</b>	1.3 - 28	8.5 $\pm$ 7.3

BMI: Body mass index, SD: Standard deviation, F: Female, M: Male, JADAS: juvenile arthritis disease activity score, Hb: Hemoglobin, TLC: Total leucocytic count, PLT: Platelets, ESR: Erythrocyte sedimentation rate, ANA: Antinuclear antibodies, RF: Rheumatoid factor.

#### **Physical function and health related quality of life assessment by JAMAR in JIA patients and healthy controls.**

Physical function assessment by JAMAR for JIA patients ranged from 1 to 17 with a mean of  $6.6 \pm 4.5$  while for healthy control, it ranged from 0 to 1 with a mean of  $0.2 \pm 0.4$ . It is significantly higher in patients in comparison to healthy control ( $p = 0.001$ ). Physical function assessment by JAMAR in patients with low disease activity ranged from 0 to 5 with a mean of  $2.7 \pm 2$ , in patients with moderate disease activity it ranged from 1 to 10 with a mean of  $5.1 \pm 2.8$  while in patients with high disease activity it ranged from 3 to 17 with a mean of  $9.8 \pm 4.3$ .

Regarding health-related quality of life assessment by JAMAR for JIA patients

ranged from 1 to 19 with a mean of  $7.3 \pm 4.2$  while for healthy control, it ranged from 0 to 1 with a mean of  $0.06 \pm 0.23$ . It is significantly higher in patients in comparison to healthy control ( $p = 0.001$ ) as shown in table (2)

Health related quality of life assessment by JAMAR in patients with low disease activity ranged from 1 to 8 with a mean of  $5.1 \pm 2.3$ , in patients with moderate disease activity it ranged from 2 to 12 with a mean of  $5.3 \pm 2.6$ , while in patients with high disease activity it ranged from 4 to 19 with a mean of  $9.9 \pm 4.6$ . All JIA patients with low, moderate, and high disease activity had impaired physical function and health related quality of life assessment by JAMAR when compared to healthy control  $p < 0.05$ .

**Table 2. Physical function and health related quality of life assessment by JAMAR in JIA patients and**

healthy controls.			
	JIA patients (Mean $\pm$ SD)	Control (Mean $\pm$ SD)	p value
Physical function	6.6 $\pm$ 4.5	0.2 $\pm$ 0.4	0.001*
Health related quality of life	7.3 $\pm$ 4.2	0.06 $\pm$ 0.23	0.001*

JIA: Juvenile idiopathic arthritis, SD: Standard deviation, \*Significant  $p < 0.05$

### Correlation between physical function, HRQoL and disease activity

There was a significant moderate correlation between JADAS 27 ESR and physical function and HRQoL,  $p = 0.001$ ,  $0.002$  respectively. There was moderate correlation between active joint count and HRQoL and physical function in JIA patients ( $r = 0.43$ ,  $r = 0.65$  respectively).

Health related quality of life was moderately correlated with physical function in JIA patients,  $r = 0.5$ ,  $p = 0.002$ . Physical function and HRQoL were moderately correlated with ESR ( $r = 0.44$ ,  $p = 0.008$ ,  $r = 0.42$ ,  $p = 0.01$

respectively). There was a negative correlation between HB and HRQoL,  $r = -0.37$ ,  $p = 0.02$ . However, no detected correlation between HRQoL and physical function with other studied parameters (e.g., age, disease duration, BMI, TLC and PLT), where  $p$  values  $> 0.05$  as shown in table (3) and (4)

**Table 3. correlation between physical function, clinical and laboratory parameters.**

	Physical function	
	r	p
Age	0.04	0.79
Disease duration	0.23	0.17
BMI	0.06	0.73
Active joint count	0.65	0.001*
HB	-0.3	0.07
TLC	0.11	0.53
PLT	0.09	0.59
ESR	0.44	0.008*
JADAS 27 ESR	0.6	0.001*

BMI: body mass index, HB: hemoglobin, TLC: total leucocytic count, PLT: platelets, ESR: erythrocyte sedimentation rate, JADAS 27 ESR: Juvenile arthritis disease activity score 27 ESR \*Significant  $p < 0.05$

**Table 4. correlation between Health-related quality of life, clinical and laboratory**

parameters.		
	Health related quality of life	
	r	p
Age	-0.1	0.55
Disease duration	-0.11	0.5
BMI	-0.01	0.94
Active joint count	0.43	0.01*
HB	-0.37	0.02
TLC	0.14	0.41
PLT	0.01	0.94
ESR	0.42	0.01*
JADAS 27 ESR	0.5	0.002*

BMI: body mass index, HB: hemoglobin, TLC: total leucocytic count, PLT: platelets, ESR: erythrocyte sedimentation rate, JADAS 27 ESR: Juvenile arthritis disease activity score 27 ESR \*Significant p value < 0.05

## Discussion

Juvenile idiopathic arthritis is a group of heterogeneous disorders that has an impact on physical function and health related quality of life. It affects growth and puberty with disruption in performance of usual tasks. <sup>(8)</sup>

While juvenile idiopathic arthritis affects all facets of a patient's life as well as the lives of their family, a clinical evaluation must include checking the patient's health-related quality of life and physical function. A thorough evaluation, health-related quality of life takes into account physical symptoms, functional status, and the influence of disease on social and psychological functioning <sup>(9)</sup>.

To determine the relationship between disease activity and physical function as well as health-related quality of life in patients with JIA, this study was conducted.

This study included 34 patients diagnosed with JIA mainly (73 %) females. This was in agreement with the female predominance commonly seen in JIA <sup>(10)</sup>.

Regarding subtypes, the polyarticular subtype was the largest group comprising 64.7% of the total study population while the oligoarticular subtype representing 35.3%. This was similar to the studies in which the polyarticular group was the largest group <sup>(11)</sup>. But, it was in contrast to some studies where the oligoarticular type was the largest group followed by the polyarticular <sup>(12, 13, 14)</sup>.

The polyarticular subtype in our study had a significantly higher JADAS-27 ESR ( $10.4 \pm 7.4$ ) than the oligoarticular subtype ( $5.2 \pm 3.6$ ), with a p-value of 0.03. This was consistent with the findings of El Najjar and colleagues who found that the polyarticular group (5.1–19) had a comparatively higher JADAS-27 than the oligoarticular group (4.7–7.6) <sup>(17)</sup>.

When JIA patients in this study were evaluated by JAMAR for their physical



function and health-related quality of life, the results showed a significant difference between patients and healthy control group ( $p = 0.001$ ), suggesting a higher degree of impairment and worse HRQoL. According to a study by Tarakci et al., who examined the relationship between functional ability, anxiety, depression, and physical activity level in JIA, the JIA group scored higher on the Childhood Health Assessment Questionnaire (CHAQ) than the control group did ( $p = 0.000$ )<sup>(15)</sup>.

The findings demonstrated a significant correlation between physical function and HRQoL and disease activity indicators such as active joint count, ESR, and JADAS 27 ESR. This was consistent with the findings of Seid et al., who demonstrated that there was a definite relationship between disease severity and HRQoL, but that HRQoL required to be evaluated apart from clinical or treatment status.<sup>(18)</sup>

These results were contradictory to the work of Gueddari et al, who reported that in children and adolescents with JIA, insufficient physical activity does not correlate with disease activity<sup>(19)</sup>.

An additional study on the physical function, fatigue, disease activity, and health-related quality of life in JIA. Regardless of the degree of disease activity, patients with polyarticular juvenile idiopathic arthritis scored lower than healthy controls on all dimensions of the Pediatric Quality of Life Inventory (PedsQL) Multidimensional Fatigue Scale. HRQoL and the number of active joints do not correlate<sup>(20)</sup>.

There was no correlation between HRQoL and physical function with the study

parameters (e.g., age, disease duration, BMI, TLC and PLT), where  $p > 0.05$ . This agreed with a study which evaluated the health-related quality of life and functional disability in children from Beni-Suef with JIA. The study also found no correlation between the functional disability and other studied parameters, such as age, weight, height, and routine lab work, and the CHAQ disability index and visual analog scale<sup>(16)</sup>. But, it was contradictory to the study of El Najjar and her colleagues who reported a strong correlation between the patients' age and the duration of their disease as determined by the CHAQ physical function test<sup>(17)</sup>.

In our study, although physical function and HRQoL were significantly correlated with measures of disease activity (active joint count, JADAS 27 ESR and ESR), all JIA patients even those with low disease activity had impaired physical function and HRQoL.

Ultimately, the results of this study emphasize the significance of evaluation of physical function and HRQoL as a significant part of clinical evaluation of JIA patients. It should be performed independently of disease activity assessment as this affects patients' daily activities, and their quality of life.

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