Original article

Health-related quality of life assessment in a group of children with juvenile idiopathic arthritis

Background: *JIA is known to affect the physical and social wellbeing and impact scholastic achievement of children. Health-related quality of life (HRQOL) is an important outcome measure in understanding the impact of chronic illness.* ***Objective:*** *We sought to evaluate the HRQOL of a group of children with juvenile idiopathic arthritis (JIA) to uncover their main problems that might prevent them from leading a normal life.* ***Methods:*** *We consecutively enrolled 119 JIA patients who were classified according to the ILAR criteria into 16 cases with oligoarticular (13.4%), 36 with polyarticular (30.3%) and 67 with systemic JIA (56.3%). They were 62 (52.1%) males and 57 (47.9%) females with a mean age of 7.7 years. Patients were evaluated by the Pediatric Quality of Life Inventory TM Version 4.0 (PedsQLTM) questionnaire.* ***Results:*** *Physical and feeling problem scores were negatively correlated to age, age at onset, diagnostic lag and diseases duration. The learning problem score showed negative correlation with age, age at onset and receival of non-steroidal anti-inflammatory drugs (NSAIDs) pointing to the favorable effect of pain control on the quality of life. Also, learning and social problem scores were positively correlated to the diagnostic lag. Total scores showed negative correlation with age and age at onset.* ***Conclusion:*** *JIA has an important impact on the HRQOL and normal development. Pain control is mandatory for reduction of learning problems via the judicious use of NSAIDs and the delay in diagnosis was associated with unfavorable learning and social outcome.*

Keywords: HRQOL; JIA; NSAIDs

Elham M. Hossny, Amira F. El-Hattab, Batoul M. Abdel Raouf *, Mahmoud R. Hassan**

*Pediatric Allergy and Immunology Unit, *Pediatric Psychiatry Unit, **Resident, Children's Hospital, Ain Shams University, Cairo, Egypt*

Correspondence:
Amira El-Hattab, Lecturer of Pediatrics, Pediatric Allergy & Immunology Unit, Children's Hospital, Ain Shams University, Cairo 11566, Egypt., Email: amiraelhatab @gmail.com

INTRODUCTION

Juvenile idiopathic arthritis (JIA) is a type of arthritis that causes joint inflammation and stiffness for more than six weeks in a child aged 16 years or younger. It is classified into seven categories; systemic-onset type, persistent and extended oligoarthritis, polyarthritis with rheumatoid factor negative, polyarthritis with rheumatoid factor positive, psoriatic arthritis, enthesitis-related arthritis and undifferentiated arthritis.[1,2]

Juvenile idiopathic arthritis affects not only the patients, but also their caregivers, thereby altering the quality of life of all involved family members.[3] The understanding of the extent to which juvenile idiopathic arthritis can affect quality of life will help establish therapeutic, environmental, and behavioral interventions allowing for a more favorable disease outcome.[4]

Quality of life is defined as the perception that individuals have of their position in life in the context of the culture and system of values in which they live and in relation to their objectives, expectations, standards, and concerns. Quality of life can change according to the environment and the experiences, as well as in response to certain diseases.[5] Pediatric Quality of life inventory version (pedsQL Generic Core Scale) Child – Report the PedsQL has 23 items and covers Physical, emotional, social, and school functioning and wellbeing.[6]

We sought to measure the health-related quality of life of a group of children with juvenile idiopathic arthritis to reveal their main problems that hinder their wellbeing. The ultimate objective is to alleviate design the best strategies that would help them lead a normal life.

METHODS

Study Population

This analytical cross-sectional study was conducted at the Pediatric Allergy and Immunology Unit of the Children's Hospital, Ain Shams University during the period from May 2018 to May 2019. The study gained approval from the local ethics' committee of the Department of Pediatrics, Ain

Shams University. Informed consent was taken from the parents or caregivers prior to enrolment.
The sample included 119 patients who were enrolled consecutively. Patients were classified into Oligoarticular JIA, Polyarticular JIA and Systemic JIA.

Inclusion Criteria:

- Patients with JIA aged 1-18 years.
- Regular therapy and follow up.

Exclusion Criteria:

- Concomitant chronic illness
- Major social problems such as the single parents' setting

Study measurements

- Clinical evaluation including the current physical status and disease activity.
- Data collected included age, sex, ethnicity, socioeconomic status, family structure, parental marital status/education/employment, and adolescents' educational and prevocational status (including statements of special educational need. Other data included JIA onset subtype, age at onset, age at diagnosis, disease duration, and independent health behaviors (self-medication, independent consultations).
- Patient and parent data were collected using individual questionnaires of HRQOL. This was achieved by the HRQOL was assessed using The PedsQL which consists of 23 items and covers Physical, emotional, social, and school functioning and wellbeing.

PedsQL 4.0 Generic Core Scales encompass the following

1. Physical functioning scale (8 items)
2. Emotional functioning scale (5 items)
3. Social functioning scale (5 items)
4. School functioning scale (5 items)

The PedsQL4.0 Generic Core Scales comprise parallel child self-report and parent proxy-report formats. It encompasses individual questionnaires of HRQOL (Table 1).

Table 1. The PedsQL4.0 Generic Core Scales Questionnaire

IN THE PAST MONTH how much of a problem has this been for you .....

ABOUT MY HEALTH AND ACTIVITIES (problems with...)	Never	Almost Never	Sometimes	often	almost always
1- It is hard for me to walk more than one block	0	1	2	3	4
2- It is hard for me to run	0	1	2	3	4
3- It is hard for me to do sports activity or exercises	0	1	2	3	4
4- It is hard for me to left something heavy	0	1	2	3	4
5- It is hard for me to take a bath or shower by my self	0	1	2	3	4
6- It is hard for me to do chores around the house	0	1	2	3	4
7- I hurt or ache	0	1	2	3	4
8- I have low energy	0	1	2	3	4

ABOUT MY FEELINGS (problems with …)	Never	Almost Never	Sometimes	often	almost always
1- I feel afraid or scared	0	1	2	3	4
2- I feel sad or blue	0	1	2	3	4
3- I feel angry	0	1	2	3	4
4- I have trouble sleeping	0	1	2	3	4
5- I worry about what will happen to me	0	1	2	3	4

HOW I GET ALONG WITH OTHERS (problems with …)	Never	Almost Never	Sometimes	often	almost always
1- I have trouble getting with other teens	0	1	2	3	4
2- Other Teens do not want to be my friend	0	1	2	3	4
3- Other teens lease me	0	1	2	3	4
4- I cannot do things that other teens my age can do	0	1	2	3	4
5- It is hard to keep up with other teens my age	0	1	2	3	4

ABOUT SCHOOL (problems with …)	Never	Almost Never	Sometimes	often	almost always
1- It is hard to pay attention in class	0	1	2	3	4
2- I forgot things	0	1	2	3	4
3- I have trouble keeping Up with my schoolwork	0	1	2	3	4
4- I miss school because of not feeling will	0	1	2	3	4
5- I miss school to go to the doctor or hospital	0	1	2	3	4

Interpretation of the HRQOL testing

It utilizes a recall period of one month and gives five response choices on an ordinal scale ranging from never to almost always. The mean HRQOL summery score (all 23 item) are calculated in addition to mean scores for each of the four subscales, plus a mean psychosocial health summary score (the 15 items from the emotional, social and school scales). Items are reversely scored and linearly transformed to a 0–100 scale (0 100, 1 = 75, 2 = 50, 3 = 25, 4 = 0), so that higher PedsQL 4.0 scores indicate better HRQOL. This direct linear transformation does not affect the measurement properties of the scales and is computed for ease of interpretation so that scores near 0 indicate poorer HRQOL and scores near 100 indicate better HRQOL. Scale scores are computed as the sum of the items divided by the number of items answered (this accounts for missing data). If >50% of the items in the scale are missing, the scale score is not computed.[6]

Statistical analysis

The results were tabulated, graphically represented and analyzed using standard computer statistical software. Data were analyzed using IBM© SPSS© Statistics version 23 (IBM© Corp., Armonk, NY) and MedCalc© version 18.2.1 (MedCalc© Software bvba, Ostend, Belgium). Skewed numerical data were presented as median and interquartile range and between-group differences were compared using the Mann-Whitney U-test (for two-group comparison) or the Kruskal Wallis test for multiple-group comparison. The Conover test was used for post-hoc comparison after the Kruskal Wallis test if needed. Categorical variables were presented as number and percentage or ratio and differences were compared using the Pearson chi-squared test. Correlations were tested using the Spearman rank correlation.

RESULTS

The study included 119 patients who were enrolled consecutively. Patients were sub-classified into 67 patients with systemic JIA (S-JIA), 36 with polyarticular JIA (P-JIA) and 16 with oligoarticular JIA (O-JIA). There were no statistically significant differences between the three categories of JIA in terms of age at onset, diagnostic lag and disease duration**.**

Analyzing the pedsQL generic core scale scores revealed that the three categories of JIA were comparable in terms of physical, feeling, learning and social problems scores no statistical difference was found (Table 2; Fig 1).

Table 2. Comparison between the three JIA groups according to the pedsQL generic core scale scores

Variable	JIA subtype						$\chi2(2)$	P-value*
	Oligoarticular JIA (n=16)		Polyarticular JIA (n=36)		Systemic JIA (n=67)			
	Median	IQR	Median	IQR	Median	IQR		
Physical problems score	6	0 - 15	1	0 - 7	2	0 - 4	2.891	.236
Feeling problems score	3	1 - 6	2	0 - 4	0	0 - 3	5.343	.069
Learning problems score	2	0 - 6	0	0 - 2	0	0 - 3	2.971	.226
Social problems score	6	4 - 10	6	3 - 8	5	2 - 9	0.853	.653

P-value > 0.05: Non-significant; P-value < 0.05: Significant. Data are presented as median and interquartile range (IQR). $\chi2$ = chi-squared statistics. * Kruskal Wallis test.

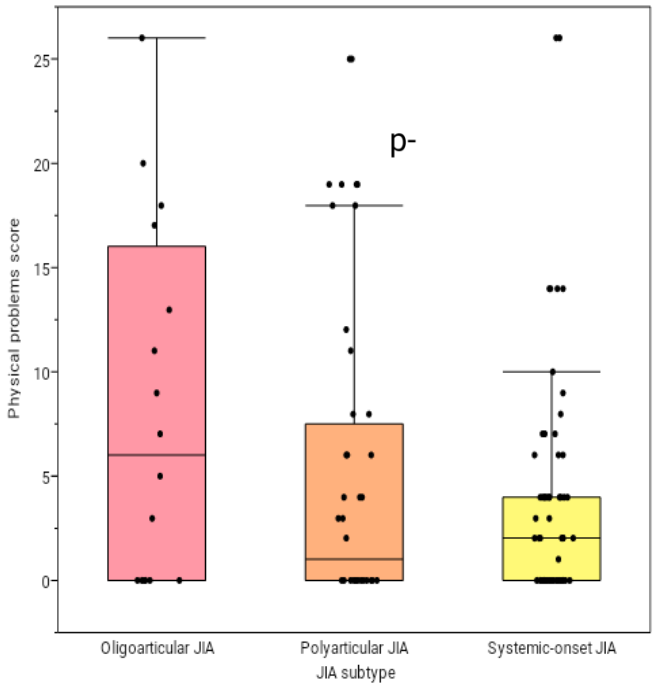

Figure 1. Box plot illustrating physical problems score in the three studied JIA groups. Each box represents the interquartile range. Line inside the box represents the median. Whiskers represent minimum and maximum values excluding outliers. Dots represent individual observations

In children with oligoarticular JIA, feeling problems scores were negatively correlated to the current age and duration of illness. Other parameters were insignificantly related (Table 3).

Table 3. Correlations between pedsQL Generic Core Scale scores and age, age at onset, diagnostic lag and disease duration in children with oligoarticular JIA

Variable		Physical problems score	Feeling problems score	Learning problems score	Social problems score
Age	Spearman rho	.027	-.499	-.180	.188
	P-value	.920	.049	.504	.486
Age at onset	Spearman rho	.057	-.351	-.151	.136
	P-value	.833	.183	.577	.616
Diagnostic lag	Spearman rho	-.322	-.016	-.470	.191
	P-value	.223	.953	.066	.479
Disease duration	Spearman rho	-.025	-.684**	-.079	.150
	P-value	.926	.003	.772	.581

P-value > 0.05: Non-significant; P-value < 0.05: Significant

Data of children with systemic JIA showed several significant correlations to pedsQL generic core scale scores. Physical problems were negatively correlated to current age, age at onset and duration of illness. Learning problems were negatively correlated to current age and age at onset and positively correlated to the diagnostic lag. Social problems were also positively correlated to the diagnostic lag (Table 4). On the other hand, no similar correlations could be detected in the group of polyarticular JIA.

Table 4. Correlation between pedsQL generic core scale scores in patients with systemic JIA and age, age at onset, diagnostic lag and disease duration

Variable		Physical problems score	Feeling problems score	Learning problems score	Social problems score
Age	Spearman rho	-.356**	-.082	-.303*	-.166
	P-value	.003	.508	.013	.179
Age at onset	Spearman rho	-.246*	-.072	-.358**	-.234
	P-value	.045	.564	.003	.057
Diagnostic lag	Spearman rho	-.127	.153	.382**	.278*
	P-value	.305	.215	.001	.022
Disease duration	Spearman rho	-.249*	-.073	-.119	.022
	P-value	.043	.557	.339	.861

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed)

The correlations between physical problems scores and current age (Fig 2), age at onset (Fig 3) and duration of illness (Fig 4) in the three JIA groups are displayed in scatter plots. Relevant illustration in relation to learning problems (Fig 5-7) and social problem scores (Fig 8) are also displayed. The most evident relations belong to the group of systemic JIA group.

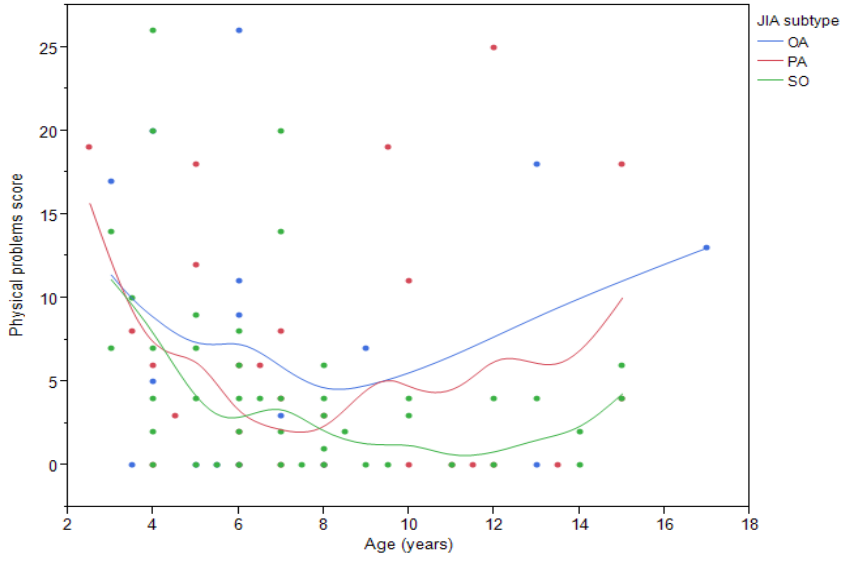

Figure 2. Scatter plot illustrating the correlation between age and physical problem scores in the three JIA groups. Dots represent individual observations. Lines represent smoothed regression lines.
OA: oligoarticular; PA: polyarticular; SO: systemic onset

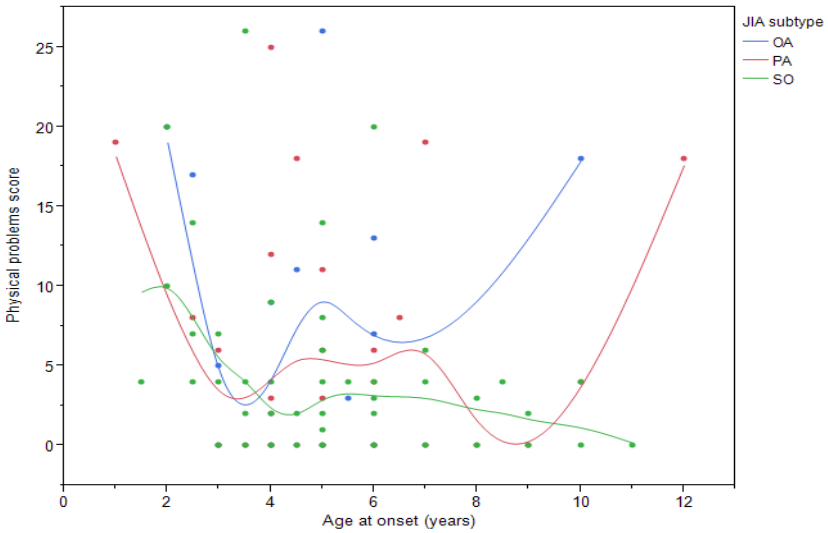

Figure 3. Scatter plot illustrating the correlation between age at onset of JIA and physical problem scores in the three JIA groups. Dots represent individual observations. Lines represent smoothed regression lines.
OA: oligoarticular; PA: polyarticular; SO: systemic onset

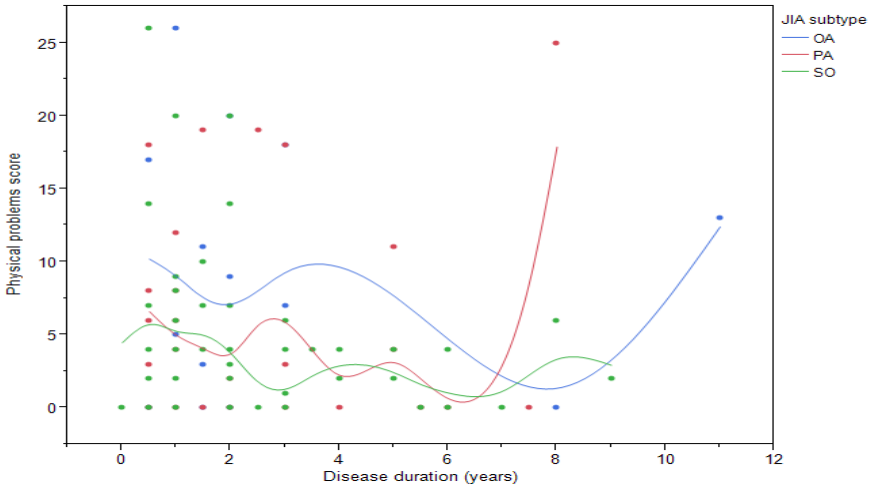

Figure 4. Scatter plot illustrating the correlation between disease duration and physical problem scores in the three JIA groups. Dots represent individual observations. Lines represent smoothed regression lines
OA: oligoarticular; PA: polyarticular; SO: systemic onset

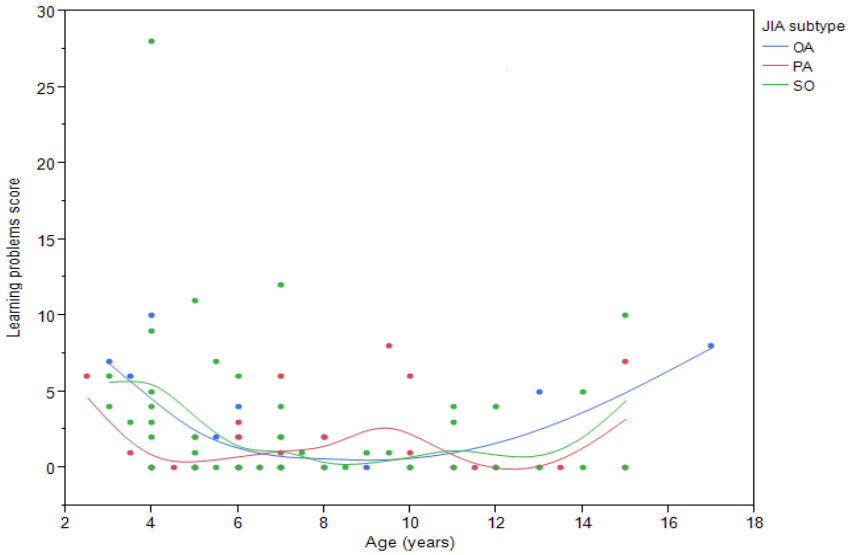

Figure 5. Scatter plot illustrating the correlation between the age and learning problem scores in the three JIA groups. Dots represent individual observations. Lines represent smoothed regression lines
OA: oligoarticular; PA: polyarticular; SO: systemic onset

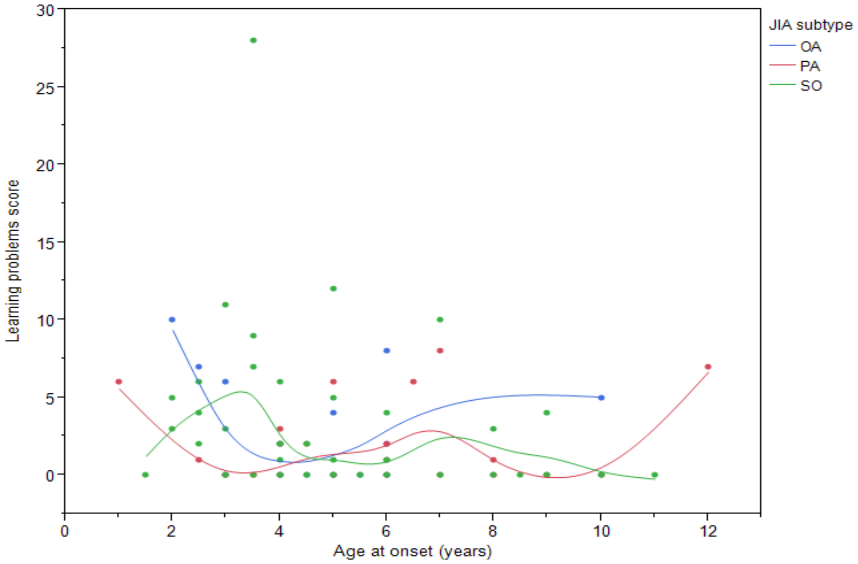

Figure 6. Scatter plot illustrating the correlation between the age at onset of JIA and learning problem scores in the three JIA groups. Dots represent individual observations. Lines represent smoothed regression lines
OA: oligoarticular; PA: polyarticular; SO: systemic onset

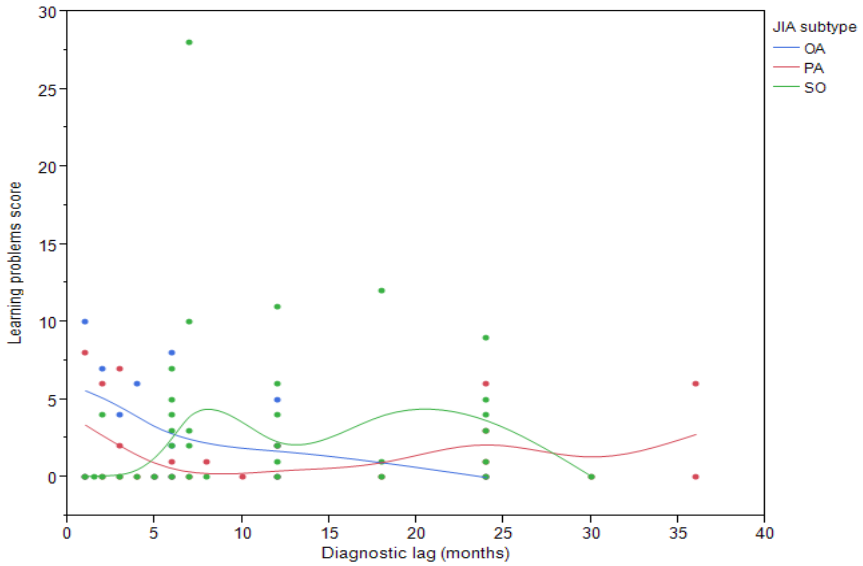

Figure 7. Scatter plot illustrating the correlation between diagnostic lag and learning problem scores in the three JIA groups Dots represent individual observations. Lines represent smoothed regression lines
OA: oligoarticular; PA: polyarticular; SO: systemic onset

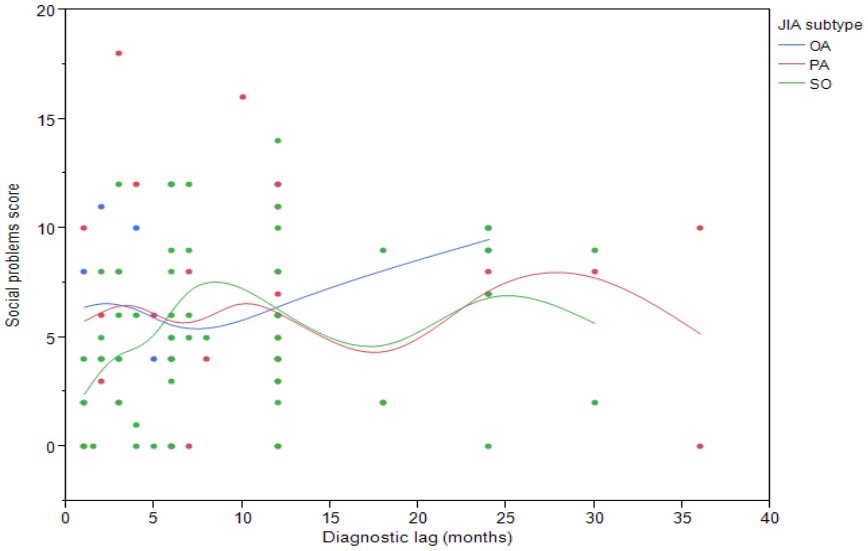

Figure 8. Scatter plot illustrating the correlation between diagnostic lag and social problem scores in the three JIA groups. Dots represent individual observations. Lines represent smoothed regression lines
OA: oligoarticular; PA: polyarticular; SO: systemic onset

The pedsQL generic core scale scores results did not vary significantly with the mode of therapy received except for learning problem that were significantly higher in children not receiving NSAIDs (Fig 9). Moreover, we did not record a statistically significant influence for physiotherapy on pedsQL generic core scale scores on physical, feeling, social or learning problems.

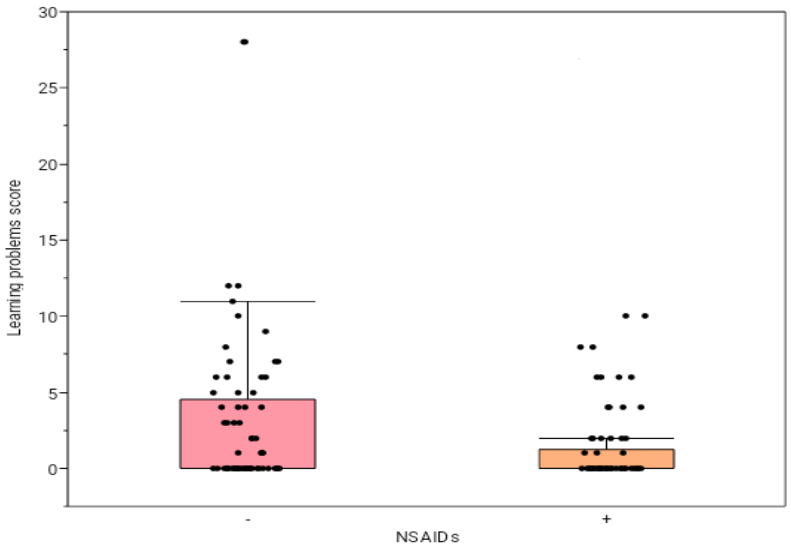

Figure 9. Box plot illustrating learning problems score in patients receiving or not receiving NSAID. Box represents the interquartile range. Line inside the box represents the median. Whiskers represent minimum and maximum values excluding outliers. Dots represent individual observations.

DISCUSSION

The World Health Organization (WHO) defines health as "a state of complete physical, mental and social well-being". Clinical studies and everyday medical practice focus on the analysis of somatic symptoms and the effects of their treatment while omitting the mental and social aspects. The quality of life is particularly important for patients suffering from chronic diseases, including JIA. The latter is the most common form of chronic arthritis in children and adolescents; it affects the physical as well as emotional and sociological well-being of approximately 1 in 1000 children under the age of 16 years.[7] It also affects mental functioning and impacts scholastic achievement. As children reach adulthood, they might face continuing disease activity, medication-associated morbidity, life-long disability, and an increased risk of emotional and social dysfunctioning.[8]

We therefore sought to investigate the level of HRQOL in a group of Egyptian children suffering from JIA by using the PedsQL testing which consists of 23 items and covers physical, emotional, social, and school functioning and wellbeing in relation to various modes of onset.[6] The ultimate objective of this pilot cross-sectional study was to stimulate efforts of improving the quality of life of JIA patients and their families.

We consecutively enrolled 119 patients with JIA for this analysis. The over expression of systemic JIA in our sample is due to the fact that our Pediatric Allergy/Immunology Unit represents a tertiary referral center that receives more serious cases that need advanced modes of management. The relative paucity of cases of oligoarticular JIA among our series could be explained by the relatively mild manifestations of this category that does not urge frequent and regular follow up at specialized units.

The studied subgroups were comparable in terms of age and gender. There were no significant variations between the three categories of JIA in terms of age of onset, diagnostic lag and disease duration. A relevant study on JIA noted that the male to female ratio was 1.7:1 and that systemic onset JIA patients were significantly younger than the polyarticular type at disease onset. Also, age of onset was earlier in patients with oligoarticular-extended disease compared to the other subtypes.[9] The difference could be related to the sampling enrollment manner.

Analyzing the PedsQL generic core scores revealed that the three subgroups of JIA were comparable in terms of physical, feeling, learning and social problem scores. This observation agrees with data reported by Oliveira and coworkers[10] who found that HRQOL results of the studied patients with systemic arthritis, polyarthritis, and extended oligoarthritis were equally altered in their series.

Data of our children with systemic JIA revealed several significant correlations to PedsQL core score parameters. Physical problems were negatively correlated to current age, age of onset and duration of illness meaning that the younger the

child the longer the duration of illness the higher the impact of physical disability on his/her quality of life. Learning problems were negatively correlated to the current age and age of onset and positively correlated to the diagnostic lag. This reflects the negative impact of the diagnostic lag on the scholastic achievement. It also means that children who are very young at systemic disease onset will not be able to start learning activities at proper time and this will lead to significant learning problems. The social problems' score was also positively correlated to the diagnostic lag. This means that the delay in reaching a correct diagnosis alters the proper social relations for the affected subject. Noteworthy is that systemic JIA is frequently underestimated in clinical settings; the diagnosis needs a high index of suspicion and is often delayed due to the masking of manifestations by the overuse of NSAIDs as antipyretics.

In the current study, children with oligoarticular JIA had feeling problem scores that were negatively correlated to the current duration of illness. A relevant study conducted on 308 adolescents with oligoarticular JIA reported that HRQOL were less than optimal, particularly in the domains of gross motor and systemic functioning. Items most frequently rated as adolescents' biggest psychological problems were "felt frustrated" and "felt depressed," which were explainable by functional disability, pain and disease activity.[11]

On the other hand, Oliveira and associates[11] noted that patients with persistent oligoarthritis had a better HRQOL than those with the other subtypes in all domains and they explained their finding by the fact that persistent oligoarthritis is the most benign form of JIA.

We could not elicit any significant correlation between the results of PedsQL core score and age of onset, diagnostic lag or duration of illness among the polyarticular JIA group of patients. The findings are indeed limited by the sample size.

The PedsQL generic core scale results did not vary significantly with the various lines of therapy received in our series whether methotrexate, NSAIDs or biologicals except for learning problems that were significantly evident in children not receiving NSAIDs. This may be explained by the pain suffered by the JIA patients that was not alleviated by the treatment received. Pain-killing is indeed a necessity for normal daily activities including learning and sports and ignoring it would definitely affect the children's scholastic achievement and quality of life.

A relevant study on 89 patients with JIA attending the outpatient clinic of a tertiary care referral hospital in India found that more than half of their patients lost some education years because of the disease.[9] This was higher compared to data from Western countries. Only 3% of patients were behind expected grade in a relevant study from Canada.[12] The observations in the Indian setting was attributed to lack of pain control leading to increased school absence and also due to lack of social support for education in patients with arthritis. JIA is reported to significantly impair the HRQOL of children as compared with healthy peers, particularly in the physical domain. Physical well-being was mostly affected by the level of functional impairment, whereas the intensity of pain had the greatest influence on psychosocial health.[10]

A study from London was conducted on 116 patients aged 8–16 years who were taking MTX for JIA. The patients completed an adapted Parent Adherence Report Questionnaire and Pediatric Quality of Life Inventory (PedsQL) Generic and Rheumatology scales. Scores on the PedsQL physical and psychosocial subscales showed poorer HRQOL than that reported by healthy children after controlling demographic and disease variables. Children who experienced difficulty in taking MTX reported significantly poor quality of life.[13] It was frequently noted that the self-reported problems with treatment intake were significantly associated with poorer HRQOL.[14]

We did not detect a statistically significant influence for physiotherapy on the PedsQL scores whether on physical, feeling, learning or social problems. This may reflect inadequate physiotherapy modes that are delivered to our patients and may indicate the need to improve this service. It can also be explained by the lack of patients' adherence to physiotherapy which is an adjuvant mode of JIA management.

In conclusion, JIA does have an important impact on the biopsychosocial development of the patients as they grow up and this necessitates consideration of not only the disease and therapy-related outcomes but also psychological, social and vocational outcomes. Our findings suggest that HRQOL can be improved by short term control of pain via the judicious use of NSAIDs and long-term improvement of physical wellbeing via symptom control and disease modification.

The study has several limitations. Our conclusions are indeed limited by the sample size. The consecutive manner of enrollment led to uneven distribution of the studied sample on the

three JIA subgroups studied. A stratified non-random sample would give more insight as far as comparing the different sub-types of JIA is concerned. Because JIA is often characterized by periods of exacerbation and quiescence, there can be remission phases in which patients feel well and exacerbation phases in which they can have symptoms of acute inflammation. It is, therefore, difficult to determine a causal relationship in a cross-sectional study, because there is doubt about the disease activity status. However, the disease impact on the quality of life of the studied patients is quite obvious and further wide-scale longitudinal studies are needed to validate our conclusions.

REFERENCES

1. **Akioka S.** A better understanding of juvenile idiopathic arthritis with classification criteria. Nihon RinshoMeneki Gakkai Kaishi 2016;39(6):513-21.
2. **Guillemin F.** Functional disability and quality-of-life assessment in clinical practice. Rheumatology (Oxford) 2000; 1:17-23.
3. **Stelmach I, Podlecka D, Smejda K, Majak P, Jerzyńska J, Stelmach R, et al.** Pediatric caregiver's quality of life questionnaire is a useful tool for monitoring juvenile idiopathic arthritis in children. Qual Life Res 2012;21(9):1639-42.
4. **Bugatti S, Sakellariou G, Luvaro T, Greco MI, Manzo A.** Clinical, Imaging, and Pathological Suppression of Synovitis in Rheumatoid Arthritis: Is the Disease Curable? Front Med (Lausanne) 2018;5:140.
5. **Puchner R, Brezinschek HP, Fritz J, Herold M, Mustak M, Nothnagl T, et al.** Is the state of health of rheumatoid arthritis patients receiving adequate treatment, predictable? - Results of a survey. BMC Musculoskelet Disord 2015;16:109.
6. **Varni JW, Seid M, Kurtin PS.** PedsQL™ 4.0: Reliability and validity of the Pediatric Quality of Life Inventory™ Version 4.0 Generic Core Scales in healthy and patient populations. Medical care 2001;39(8):800-12.
7. **Ravelli A, Martini A.** Juvenile idiopathic arthritis. Lancet 2007; 369(9563):767-78.
8. **Moorthy AK, Bovik AC.** blind image quality assessment from scene statistics to perceptual quality. IEEE Trans Image Process 2011;20(12):3350-64.
9. **Sarma PK, Misra R, Aggarwal A.** Physical disability, articular, and extra-articular damage in patients with juvenile idiopathic arthritis. Clin Rheumatol 2008; 27(10):1261-5.
10. **Oliveira S, Ravelli A, Pistorio A, Castell E, Malattia C, Prieur AM, et al.** Proxy reported health related quality of life of patients with juvenile idiopathic arthritis: The Pediatric Rheumatology International Trials Organization multinational quality of life cohort study. Arthritis Rheum. 2007; 57(1):35-43
11. **Shaw KL, Southwood TR, Duffy CM, McDonagh JE.** Health-related quality of life in adolescents with juvenile idiopathic arthritis. Arthritis Rheum 2006; 55(2):199-207.
12. **Oen K, Malleson PN, Cabral DA, Rosenberg AM, Petty RE, Cheang M.** Disease course and outcome of juvenile rheumatoid arthritis in a multicenter cohort. J Rheumatol 2002; 29(9):1989-99.
13. **Mulligan K, Wedderburn LR, Newman S.** The experience of taking methotrexate for juvenile idiopathic arthritis: results of a cross-sectional survey with children and young people. Pediatr Rheumatol 2015;13(1):58.
14. **Haverman L, Grootenhuis MA, van den Berg JM, van Veenendaal M, Dolman KM, Swart JF, et al.** Predictors of health-related quality of life in children and adolescents with juvenile idiopathic arthritis: results from a Web-based survey. Arthritis Care Res (Hoboken) 2012; 64(5):694-703.