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ORIGINAL ARTICLE

Pediatric to adult rheumatology transition: Success rates, influencing factors, and evolving diagnoses and treatments

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ABSTRACT

Objectives: This study aimed to evaluate the rate of successful transitions, identify factors associated with early versus late transitions, and diagnosis and treatment changes after transition into adult rheumatology.

Patients and methods: In this retrospective study, patients with childhood-onset rheumatic diseases who transitioned from pediatric to adult rheumatology care between January 2013 and January 2023 were screened for a successful transition. Successful transitions were defined as maintaining annual visits to the adult rheumatology clinic after transition. Early transition was defined as less than three months between the last pediatric and first adult rheumatology visits.

Results: Out of 2,552 referred patients, 210 (8.2%) patients (117 females, 93 males; mean age: 25.2±5.6 years; range, 18 to 44 years) transitioned successfully. Juvenile idiopathic arthritis and familial Mediterranean fever were the most prevalent rheumatic diseases. The median transition time was four months (interquartile range, 1 to 13 months) in patients with successful transition, and the early transition rate was 46.7%. Receiving biologic disease-modifying antirheumatic drugs was found to be associated with early transition (28.6% *vs.* 17.0%, p=0.040), and higher education levels and familial Mediterranean fever diagnosis were found to be associated with late transition. The treatment was changed for about half of the patients after transition to adult rheumatology. Patients with juvenile idiopathic arthritis were reclassified in 25 (31.6%) patients as rheumatoid arthritis, in 22 (27.8%) patients as ankylosing spondylitis, in 20 (25.3%) patients as nonradiographic axial spondyloarthritis, and in eight (10.1%) patients as psoriatic arthritis.

Conclusion: A successful transition to adult rheumatology is essential for adolescents and young adults with childhood-onset rheumatic diseases. The successful transition rate in this study was relatively low, highlighting the need for standardized transition programs.

Keywords: Disease-modifying antirheumatic drugs, juvenile idiopathic arthritis, pediatric rheumatology, transition.

The transition from pediatric to adult care is a crucial phase for patients with childhood-onset chronic illnesses. In patients with childhood-onset rheumatic diseases, such transitions are significant due to the chronic and often progressive nature of these conditions, requiring continuous and specialized care. The Society for Adolescent Medicine defines this pivotal transition as "the purposeful, planned movement of adolescents and young adults with chronic physical and medical conditions from a child-centered to an adult-oriented healthcare system."[1]

Despite the importance of a smooth transition, many patients experience difficulties during this period. Studies have shown that transition success rates vary widely, with several factors influencing outcomes, including the presence of structured transition programs, patient readiness, and the nature of the disease.[2,3] The European Alliance of Associations for Rheumatology (EULAR) and the Pediatric Rheumatology European Society (PReS) have emphasized the need for standardized transition policies and multidisciplinary approaches to improve transition outcomes.[4] However, the implementation of

such guidelines remains inconsistent across different regions and healthcare settings.[5] The transition process is of paramount significance for both healthcare providers and researchers, as prolonged transition periods have been linked to increased mortality and morbidity rates.[6-9] Unfortunately, unsuccessful transitions remain distressingly high, with prior research indicating that nearly half of the patients struggle to navigate a smooth transition from pediatric to adult rheumatology care.[2,10]

The transition process involves not only the transfer of care from pediatric to adult rheumatology departments but also encompasses broader challenges such as the adaptation to adult healthcare settings, changes in treatment protocols, and reclassification of diseases. For instance, juvenile idiopathic arthritis (JIA), which is the most common rheumatic inflammatory condition in childhood, encompasses seven distinct categories, not all of which have a direct counterpart in adult rheumatology. When comparing patients meeting the JIA classification criteria with those with rheumatoid arthritis (RA), adult-onset Still's disease, spondyloarthritis (SpA), and psoriatic arthritis (PsA), research indicates that most JIA patients satisfy the criteria for one of the adult categories.[11,12] Moreover, the transition to adult rheumatology care may necessitate adjustments in terms of treatment approaches.

Pediatric rheumatology is a relatively newly developing specialty in Türkiye. In parallel with the increasing number of pediatric rheumatology clinics, the number of pediatric rheumatology patients is also increasing. Successful transition of patients from pediatric to adult rheumatology is an increasingly important issue for both adult and pediatric rheumatology. This study aimed to examine the rate of successful transition, factors associated with early transition, and diagnosis and treatment changes in patients with childhood-onset rheumatic diseases after transition into adult rheumatology.

PATIENTS AND METHODS

This retrospective investigation was carried out at the Dokuz Eylül University Research and Application Hospital. The Department of Pediatric Rheumatology was established in 2011, and all childhood rheumatic diseases, including JIA, periodic fever syndromes, Behçet's disease, systemic lupus erythematosus (SLE), and vasculitis, were treated and followed in this department. The Department of Adult Rheumatology treated and followed all adulthood rheumatic diseases, including RA, SpA, SLE, familial Mediterranean fever (FMF), Behçet's disease, and vasculitis. In Türkiye, patients with rheumatic diseases are transitioned from pediatric to adult care at the age of 18. Patients aged 18 or older with childhood-onset rheumatic diseases and followed by pediatric rheumatology clinics between January 2013 and January 2023 were screened for transition to adult rheumatology. Patients who were transitioning or had transitioned (within the last 10 years) from pediatric to adult rheumatology care were included in the study. Patients who were diagnosed with rheumatic diseases after age 18 and patients who transitioned from other pediatric rheumatology clinics were excluded from the study. The study protocol was approved by the Dokuz Eylül University Non-Interventional Research Ethics Committee of (date: 11.01.2023, IRB number: 2023/02-25). Informed consent was not required due to the retrospective design. This study was conducted in accordance with the principles of good clinical practice and the Declaration of Helsinki.

Data was collected on demographic characteristics, including age, sex, educational status, and parental marital status. Clinical characteristics, including pediatric rheumatology diagnosis (e.g., JIA, FMF, and Behçet's disease), use of treatment (conventional synthetic disease-modifying antirheumatic drugs [csDMARDs] or biological disease-modifying antirheumatic drugs [bDMARDs]), duration of follow-up in both pediatric and adult rheumatology departments, and disease activity after the transition. Additionally, we documented changes in diagnoses and diagnosis-specific treatment after the transition to adult rheumatology care.

Patients who maintained annual visits to the adult rheumatology clinic after transition were considered successful transitions. Early transition was defined as the period from the last admission in pediatric rheumatology to the

first admission in adult rheumatology being less than three months. A late transition was defined as a period exceeding three months from the last pediatric rheumatology admission to the first adult rheumatology admission. Since patients were usually followed at three-month intervals to prescribe drugs and evaluate treatment compliance in adult rheumatology, the distinction between early and late transition was determined as three months.

Statistical analysis

Data were analyzed using PASW version 18.0 software (IBM Corp., Armonk, NY, USA). The normality of the data was assessed using the Kolmogrov-Smirnov test. Continuous variables were shown as median and interquartile range (IQR) since the data were nonnormally disturbed. Categorical data were shown as frequency and percentage. Patients who successfully transitioned to adult rheumatology were divided into early and late transition groups, and the two groups were compared. Continuous variables were compared with the Mann-Whitney U test, while categorical data were compared with the chi-square test. A p-value <0.05 was considered statistically significant.

RESULTS

During the study period, 2,552 patients were referred from the pediatric rheumatology department to the adult rheumatology clinic. Out of these, 962 (37.7%) patients visited the adult rheumatology department at least once, and 210 (8.2%) patients transitioned successfully (Figure 1). A total of 210 patients (117 females, 93 males; mean age: 25.2±5.6 years; range, 18 to 44 years) were included in the final analysis. One hundred twenty (57.1%) patients had a Bachelor's degree or higher educational status. The most prevalent rheumatic diseases were JIA in 79 (37.6%) patients and FMF in 79 (37.6%) patients, followed by SLE in 18 (8.6%) patients. The median duration of rheumatic diseases in the pediatric rheumatology department was 52 months (IQR, 23 to 87 months). The most common comorbid diseases were hypertension in seven (3.3%) patients and diabetes mellitus in six (2.9%) patients (Table 1).

The median transition time for successfully transitioned patients was four months (IQR, 1 to 13 months), and 98 (46.7%) patients underwent early transition. The use of bDMARDs was found to be associated with early transition (28.6% *vs.* 17.0%, p=0.040). Higher education level was found to be associated with late transition; the rate of late transition was 64.3% in patients with a Bachelor's degree or higher and 35.7% in lower educational level (p=0.025). Rheumatic diseases were not significantly associated with late transition, except for FMF. The rate of late transition was higher in patients with FMF (47.3% *vs.* 26.5%, p=0.015). Sex and parental divorce were not associated with late transition (Table 2).

After transition, the median duration of rheumatic disease in the adult rheumatology department was 40 months (IQR, 15 to 75 months). The International Classification of Diseases 10 (ICD-10) diagnosis code was changed in 75 (35.7%) patients after transitioning to adult rheumatology. All patients whose diagnosis codes changed were diagnosed with JIA during their pediatric rheumatology follow-up. Patients with JIA were reclassified as RA in 25 (31.6%) patients, as ankylosing spondylitis (AS) in 22 (27.8%) patients, as nonradiographic axial SpA in 20 (25.3%) patients, and as PsA in eight (10.1%) patients. Four JIA patients did not meet the criteria for any of the adult classifications.

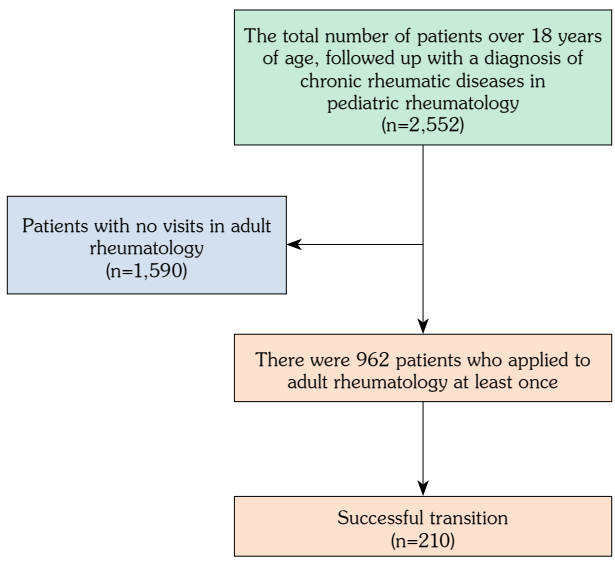

Figure 1. Flowchart of patients and their involvement in the study.

Table 1. Demographic and clinical characteristics of patients who transitioned successfully (n=210)

	n	%	Median	IQR	Mean±SD	Range
Age (year)					25.2±5.6	18-44
Sex						
Female	117	55.7				
Comorbid disease						
Diabetes mellitus	6	2.9				
Hypertension	7	3.3				
Asthma	3	1.4				
Hypothyroidism	5	2.4				
Parents' divorce	23	11.0				
Diagnose in pediatric rheumatology						
JIA	79	37.6				
FMF	79	37.6				
FMF+JIA	6	2.9				
SLE	18	8.6				
Behçet's disease	9	4.3				
Others	19	9.0				
Duration of pediatric rheumatology followed-up (month)			52	23-87		
Duration of transition			4	1-13		
Duration of adult rheumatology followed-up (month)			50	18-77		
Education status						
Under Bachelor's degree	90	42.9				
Bachelor's degree or higher	120	57.1				
Treatment with biological agents at pediatric rheumatology	47	22.4				

IQR: Inter-quartile range; JIA: Juvenile idiopathic arthritis; FMF: Familial Mediterranean Fever; SLE: Systemic lupus erythematosus.

Table 2. Comparison of patients with early and late transition

	Early transition* (n=98)						Late transition (n=112)						
	n	%	Median	IQR	Mean±SD	Range	n	%	Median	IQR	Mean±SD	Range	*p*
Age (year)					25.1±5.5	18-42					25.3±5.7	18-44	0.40
Sex													
Female	55	56.1					62	55.4					0.91
Parents' divorce	9	9.2					14	12.5					0.58
Rheumatic diseases													0.015
JIA	42	43.0					37	33.0					
FMF	26	26.5					53	47.3					
FMF+JIA	2	2.0					4	3.6					
SLE	12	12.2					6	5.4					
Behçet's disease	5	5.1					4	3.6					
Others	11	11.2					8	7.1					
Duration of transition (month)			1	0-2					13	8-28			<0.001
Education status													0.025
Under Bachelor's degree	50	51.0					40	35.7					
Bachelor's degree or higher	48	49.0					72	64.3					
Treatment with biological agents at pediatric rheumatology	28	28.6					19	17.0					0.040

IQR: Inter-quartile range; JIA: Juvenile idiopathic arthritis; FMF: Familial Mediterranean fever; SLE: Systemic lupus erythematosus; * The definition of early transition is when the last admission in pediatric rheumatology to the first admission in adult rheumatology was less than three months.

Treatment changes were made in 90 (42.9%) patients included switching csDMARDs in 35 (16.7%) patients, adding csDMARDs in 22 (10.5%) patients, initiating bDMARDs in 21 (10%) patients, changing bDMARDs in five (2.4%) patients (secondary drug failure in two patients, primary drug failure in one patient, pregnancy in one patient, and adverse effects in one patient), and discontinuing bDMARDs in seven (3.3%) patients. During the adult follow-up period, 15 (7.1%) patients required hospitalization due to disease exacerbation. No mortality was recorded during the follow-up of cases in the adult clinic.

DISCUSSION

Our study provides significant insights into the transition of pediatric patients with rheumatic diseases to adult rheumatology care. Of 2,552 patients referred from pediatric to adult rheumatology, only 210 (8.2%) successfully transitioned, and the median transition time was four months. The rate of early transition was 46.7% in patients who transitioned successfully; early transition was associated with use of bDMARDs, and late transition was more common among patients with higher education levels and those diagnosed with FMF. After transitioning, a notable proportion of patients experienced changes in their rheumatic disease diagnoses and treatments.

The successful transition rate observed in our study is relatively low compared to previous studies. Hazel et al.[2] reported that 48% of patients with childhood-onset JIA transitioned to adult rheumatology. Similarly, 42% of patients with childhood-onset rheumatic diseases transitioned to adult rheumatology successfully.[3] The lack of transition protocols or guidelines was considered the most crucial factor for unsuccessful transitions. EULAR/PReS established recommendations for transition care; they focused on standardized and written transition policy and a multidisciplinary team (pediatric and adult rheumatologist) essential for a successful transition.[4] Jensen et al.[3] reported that patients who participated in a transition program had a higher successful transition rate than those who did not (42% *vs.* 23%, p=0.002). Batu et al.[13] reported that they had reached an 83.9% successful transition rate with an assessment of transition readiness and transition program, and they stated that the best-performing transition readiness assessment questionnaire (TRAQ) cutoff value was >4.0 for predicting transfer readiness in rheumatology. Ayla et al.[14] reported that the overall TRAQ score was >4 in patients who already transferred to adult rheumatology, and rheumatological diagnosis did not affect the TRAQ score. Despite recommendations, the number of centers with a written transition policy is low. In a survey conducted among European pediatric rheumatologists, only 23.9% of respondents reported that they had written a transition policy.[15] In the survey conducted by Sözeri et al.[16] among Turkish pediatric and adult rheumatologists, one-third of the participants reported having a standard transition program. The lack of consensus regarding the transition age is another reason for the low successful transition rate. In a recent systematic review, Yassaee et al.[17] found moderate evidence that models of transition involving the transfer of young people in late adolescence or early adulthood can improve transition outcomes. In our institution, the transition age was determined as 18 years; many young adults at this age frequently relocate to different cities for their university education, creating potential obstacles to a seamless transition into adult rheumatology care. In parallel with this, higher education level was found to be associated with late transition in our study. However, a lower educational state was associated with late transition or transition failure in previous studies.[18-20]

Regarding the analysis of transition times, we considered any transition period of less than three months between the two departments as an early transition, in line with the maximum drug supply period permitted by health insurance, which is typically limited to three months. The use of bDMARDs was associated with an early transition in this study. Patients on bDMARDs need to maintain regular consultations with their healthcare providers since these medications necessitate prescriptions. Therefore, it is not surprising that early transitions are more prevalent among those receiving bDMARDs. We also found that

patients with FMF were more prone to late transition. FMF patients had lower compliance with follow-up visits in adult rheumatology. Bilici Salman et al.[21] reported that only half of FMF patients were compliant with follow-up visits. FMF is characterized by febrile attacks of polyserositis, and FMF patients might feel perfectly fine between attacks. This can lead to a perception that regular follow-ups are unnecessary unless they experience attacks. Consequently, they might delay transitioning to adult care because they do not need regular follow-up appointments.

The diagnosis of rheumatic diseases generally remained unchanged after transitioning to adult rheumatology care, except for JIA. JIA encompasses seven distinct categories, and not all align with counterparts in adult rheumatology classification criteria.[22] Frequently, the diagnosis of patients with JIA is reclassified using adult rheumatology termination after the transition to adult rheumatology. Oliveira-Ramos et al.[23] found that only 21% of 426 JIA patients were unclassifiable in adulthood. Most were reclassified as having RA (34%) and AS (13.5%), followed by undifferentiated SpA and PsA. Similarly, Felis-Giemza et al.[24] reported that 41% of 138 JIA patients were rediagnosed in adult care, most frequently as RA or SpA. In our study, patients with JIA were reclassified as having RA (31.6%), AS (27.8%), nonradiographic axial SpA (25.3%), and PsA (10.1%). Only four JIA patients could not be reclassified. The primary reason for reclassification lie in determining disease activation since the disease activation score used to assess childhood disease activity may not apply in adulthood.[25] Another reason may be to increase treatment options. A highly effective treatment choice is bDMARDs when csDMARDs are ineffective. Adult-onset arthritis offers a broader range of bDMARD treatment options compared to childhood-onset arthritis. As a result, when a patient with JIA transitions to adult rheumatology and meets the criteria for adult-onset arthritis, a change in diagnosis can broaden their treatment options. In our study, bDMARDs were initiated for the first time in 21 (10%) patients and switched to a different bDMARD in five (2.3%) patients. Treatment adjustments may be necessary for various reasons for patients with rheumatic diseases. In our study, treatment changes were required in half of the patients after transitioning to adult rheumatology care. Disease activation and pregnancy planning were the primary reasons for treatment changes in these patients. Kobrová et al.[26] similarly reported a treatment change in 36% of patients with rheumatic diseases after transitioning to adult rheumatology, with most adjustments aimed at addressing disease activation.

This study had several limitations. First, our study was conducted at a single center, which may limit the generalization of the results to broader populations and various healthcare settings. The retrospective design may have introduced bias. Additionally, the study was limited by the lack of data on patients who did not transition successfully. Disease severity during the transition period may affect transition success; however, the lack of data about disease severity limits the ability to address this issue.

In conclusion, our study provides valuable insights into the transition of patients with childhood-onset rheumatic diseases to adult rheumatology care. The successful transition rate is very low when a transition program or guideline is not followed. The insights gained from this research can inform healthcare providers and policymakers in developing strategies to improve the transition process, ensure continuity of care, and optimize treatment outcomes for these patients. The high rate of diagnostic changes after transition suggests a need for better alignment of pediatric and adult rheumatology care protocols to ensure continuity and accuracy in disease management.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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