Assessment of Down Syndrome-Associated Arthritis: A Survey of Down Syndrome Clinic Providers

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Jordan T. Jones, DO, MS[1,2], Chelsey Smith, AAHA, CCRC[1], and Nasreen Talib, MD[1]

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Introduction

Down syndrome (DS) is one of the most common birth defects in the United States[1] and is characterized by a heterogenous phenotype that results from a dosage imbalance of genes on human chromosome 21.[2] This results in an increased incidence of infections, malignancy, autoinflammatory, and autoimmune conditions.[3] Due to the heterogenous phenotype and complex needs of the child with DS, the American Academy of Pediatrics put out a clinical report for the health supervision of children with DS.[4] This report gives information and guidance on when to screen for specific conditions and when to refer to specialty care for evaluation. Inflammatory arthritis in children with DS was first described in 1984[5] and is termed Down syndrome-associated arthritis (DA). Studies have shown that DA is under-recognized with a 19-month average delay in diagnosis,[6] and most patients present with polyarticular (5 or more joints with arthritis), rheumatoid factor (RF), and anti-nuclear antibody (ANA) negative disease.[6] There are reports that DA is more prevalent than juvenile idiopathic arthritis (JIA),[7,8] which is the most common pediatric rheumatologic disease.[9] Despite this the American Academy of Pediatrics does not mention arthritis or screening for arthritis in the clinical report for health supervision of children with DS. In a survey of pediatric rheumatologists asked how they evaluate for DA, it was found that most use a combination of clinical history, physical exam, laboratory tests, and imaging studies,[10] however, there is currently no standardized approach for the assessment of DA. Additionally, it is unclear how primary care providers assess for DA prior to presentation to subspecialty care. Our objective was to describe the current practices of Down syndrome clinic providers approach to assessment and diagnosis of DA.

Methods and Materials

Using the REDCap platform, an electronic survey was created which consisted of 12 questions organized into sections regarding responder demographic characteristics, assessment, and evaluation of inflammatory arthritis in Down syndrome. Survey questions used branching logic and asked if providers were aware of DA, how they screened for it, how they diagnosed it, and if they educated families about the risk of DA. The survey questions gave multiple choices and, "choose all that apply" questions with a list of laboratory tests, and imaging studies. Many questions had an "other" category for the respondent to fill-in responses that may not be listed.

The survey was electronically sent to the Down Syndrome Medical Interest Group-USA (DSMIG-USA) electronic list-serv. The DSMIG-USA is a group of health professionals committed to promoting optimal health care and wellness of individuals with Down syndrome across the life span. Members of DSMIG-USA are professionals from a variety of disciplines who provide care to individuals with Down syndrome and their families. Members include physicians, scientists, psychologists, nurses, genetic counselors, educators, therapists, clinic coordinators, and related health professionals. Most members work in specialized Down syndrome clinics. Those on the DSMIG-USA electronic list-serv were invited by e-mail to complete the survey. Participants were asked to respond according to their personal experience, not that of institution, group practices, or based on medical literature. Respondents were asked to quantify their experience by years of practice. The survey was sent on 3 separate occasions over a 4-month period of time.

The results were analyzed by descriptive statistics performed using IBM SPSS Statistics version 24.

[1]Children's Mercy Kansas City, Kansas City, MO, USA
[2]University of Missouri, Kansas City, MO, USA

Corresponding Author:
Jordan T. Jones, Department of Pediatrics, Division of Rheumatology, Children's Mercy Kansas City, 2401 Gillham RD, Kansas City, MO 64108, USA.
Email: jtjones@cmh.edu

Table 1. Survey Respondent Characteristics of Down Syndrome Clinic Providers.

Characteristics	n (%)
Practice scope	
Pediatric	15 (39)
Family medicine	5 (13)
Internal medicine	2 (5)
Genetics	5 (13)
Developmental pediatrics	3 (8)
Other subspecialty	6 (15)
Clinic location	
Urban	38 (97)
Rural	1 (3)
Clinic setting	
Academic	25 (64)
Private practice	14 (36)
Experience (by years of practice)	
0-5 years	8 (20)
5-9 years	5 (13)
10+ years	26 (67)
Clinical time	
0-25%	8 (21)
26-50%	6 (15)
51-75%	6 (15)
>75%	19 (49)

Ethical Approval and Informed Consent

This work was conducted in accordance with the Declaration of Helsinki. Institutional review board approval was obtained from Children's Mercy Kansas City (Study00000609). All respondents consented when they voluntarily completed the survey.

Results

Of 46 survey responses received, 39 were included in analyzed as 7 were duplicate responses. Most respondents were physicians (77%) followed by nurse practitioners (13%), and trainees (10%). Most are practicing in pediatrics (39%), followed by family medicine (13%), and genetics (13%). Respondents also reported a scope of practice that included other subspecialty care (15%), internal medicine (5%), and developmental pediatrics (5%). Over half (67%) had 10+ years of practice experience in their respective field managing patients with Down syndrome. Nearly half of the respondents (49%) had greater than 75% time committed to clinical duties, and most practiced in an urban location (97%) an in an academic setting (64%) (Table 1).

The majority are aware of the risk for arthritis in DS (77%), and most screen for DA (74%) using history (82%) and physical exam (72%) to assess for arthritis. Few use laboratory tests (3%) or imaging (3%) studies as part of the diagnostic evaluation for arthritis. If laboratory tests are obtained, most obtain an anti-nuclear antibody (ANA; 56%), c-reactive protein (CRP; 67%), erythrocyte sedimentation rate (ESR; 64%), and complete blood count (CBC; 54%). If imaging is obtained, the most common study is a computed tomography scan (CT; 56%). Of survey responses, about half (49%) educate families about the risk for those with DS to develop arthritis (Figure 1).

Discussion

Down syndrome-associated arthritis (DA) remains a significant source of morbidity for children with Down syndrome (DS). Previous studies have shown that DA is under-recognized with delays in diagnosis, and frequently presents with extensive joint involvement.[6] This survey describes the real-world approach to assessment and diagnosis of DA by surveyed DSMIG-USA members.

Many of the DSMIG-USA members are aware of the risk for arthritis in children with DS, however, assessment and screening are more complex due to lack of guidance. In the most recent version of the American Academy of Pediatrics Health Supervision of Children with Down Syndrome,[4] which is used by physicians and healthcare providers to help guide screening in patients with DS, there is no mention of surveillance for arthritis. This makes it challenging to offer guidance or regular screening to families and patients. This likely explains why most the DSMIG-USA providers are aware of DA, and nearly half provide education to families about DA. A standardized, routine assessment to screen for DA or inclusion and guidance by the American Academy of Pediatrics Health Supervision of Children with Down Syndrome[4] could be used by primary care physicians and healthcare providers to assess for DA to improve areas of screening and education.

As there are no criteria for diagnosis of DA we found that many DSMIG-USA clinicians surveyed used a combination of history and physical exam to guide evaluation. Few ordered laboratory tests or imaging studies as part of their evaluation, but those that did, obtained commonly used tests to evaluate for inflammation and inflammatory changes (CBC, CRP, ESR). Additionally, an ANA and RF were frequently obtained as part of screening, which is commonly obtained when autoimmune or rheumatic diseases are considered on the differential. However, this approach may be problematic as

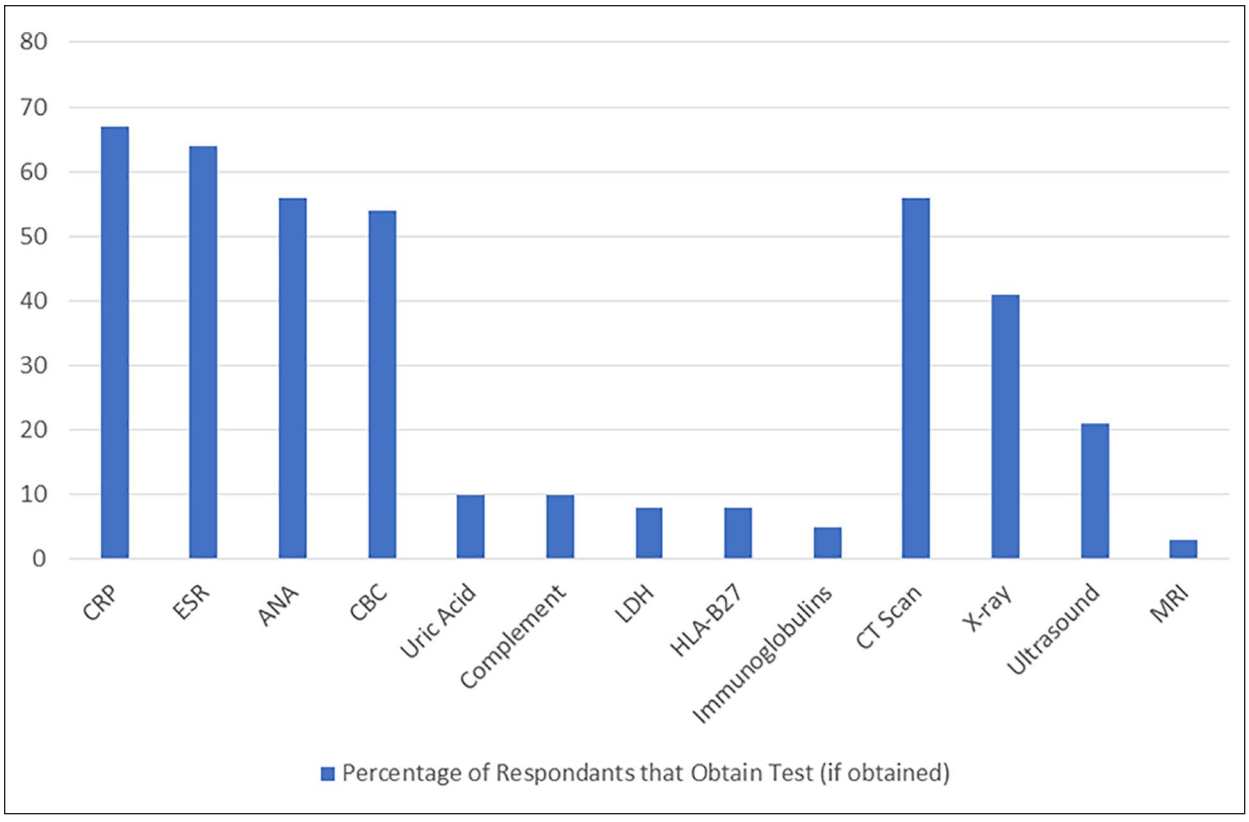

Figure 1. Laboratory tests and imaging modalities and the percentage of Down syndrome clinic providers that use these studies to screen for Down syndrome-associated arthritis.

studies show that most patients with DA present with normal CRP, ESR,[6,8] RF, and negative ANA.[6,8] Therefore, laboratory screening modalities and results must be interpreted cautiously as this alone may be a poor screening and diagnostic evaluation tool for DA. Imaging modalities were not frequently used, but most would consider obtaining CT for evaluation. While this option can obtain critical information about joints and bones it also comes with radiation exposure, which should be limited in those that are already at increased risk for malignancy.[11] For pediatric rheumatologists, X-rays were the most used imaging modality used to aid in evaluation of DA,[10] and is likely due to their accessibility, reproducibility and relatively inexpensive. However, X-rays are not sensitive enough to reveal subtle or early arthritis, and if changes are seen on X-ray it would likely indicate more chronic damage from arthritis. Ultrasound was the second most used imaging modality by pediatric rheumatologists,[10] and could be part of a novel approach to screening and diagnosis of DA since there is no need for sedation and no radiation exposure. Ultrasound also has the capabilities to pick up more subtle disease and tendon changes, but it does have limitations, which includes that it is operator dependent and may not be as reproducible from 1 technician to another making it difficult to assess and follow disease.[12]

Our study has several limitations including the low number of respondents, however, this was focused on providers in DS clinics who predominantly see children with DS. Participation bias was another limitation to our study as it is possible that many chose not to complete the survey due to lack of experience with DA. Another limitation is that respondents may have answered the survey questions based on information other than their personal experience due to the hypothetical nature of the questions and lack of details that would be seen in a case-based survey. However, the focus of this survey was intended to describe the current assessment and approach to develop a baseline for providers.

This is the first study to evaluate Down syndrome clinic providers perspectives towards diagnostic approach and assessment of DA. Most Down syndrome clinic providers are aware of DA, and almost half educate families about the risk for DA. Most utilizing history and physical exam, but rarely use laboratory tests or imaging modalities to assess for DA. More research is

needed to determine optimal education for families, diagnostic approach, and assessment specific to DA.

Author Contributions

JJ, CS, and NT equally contributed to the conception, drafting, and final version of the whole manuscript. All authors read and approved the final manuscript.

Declaration of Conflicting Interests

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ORCID iD

Jordan T. Jones https://orcid.org/0000-0003-0986-4991

References

1. de Graaf G, Buckley F, Skotko BG. Estimates of the live births, natural losses, and elective terminations with Down syndrome in the United States. *Am J med Genet A*. 2015;167A:756-767.
2. Asim A, Kumar A, Muthuswamy S, Jain S, Agarwal S. Down syndrome: an insight of the disease. *J Biomed Sci*. 2015;22:41.
3. Verstegen RHJ, Chang KJJ, Kusters MAA. Clinical implications of immune-mediated diseases in children with Down syndrome. *Pediatr Allergy Immunol*. 2020;31:117-123.
4. Bull MJ, Committee on Genetics. Health supervision for children with Down syndrome. *Pediatrics*. 2011;128:393-406.
5. Yancey CL, Zmijewski C, Athreya BH, Doughty RA. Arthropathy of Down's syndrome. *Arthritis Rheum*. 1984;27:929-934.
6. Jones JT, Talib N, Lovell D, Becker ML. Clinical features and treatment of Down syndrome arthropathy: experience from two US tertiary hospitals. *Paediatr Drugs*. 2019;21:33-39.
7. Juj H, Emery H. The arthropathy of Down syndrome: an underdiagnosed and under-recognized condition. *J Pediatr*. 2009;154:234-238.
8. Foley CM, Deely DA, MacDermott EJ, Killeen OG. Arthropathy of Down syndrome: an under-diagnosed inflammatory joint disease that warrants a name change. *RMD Open*. 2019;5:e000890.
9. Woo P, Colbert RA. An overview of genetics of paediatric rheumatic diseases. *Best Pract Res Clin Rheumatol*. 2009;23:589-597.
10. Nicek A, Talib N, Lovell D, Smith C, Becker ML, Jones JT. Assessment and treatment of Down syndrome-associated arthritis: a survey of pediatric rheumatologists. *Pediatr Rheumatol Online J*. 2020;18:57.
11. Taub JW. Relationship of chromosome 21 and acute leukemia in children with Down syndrome. *J Pediatr Hematol Oncol*. 2001;23:175-178.
12. Basra HAS, Humphries PD. Juvenile idiopathic arthritis: what is the utility of ultrasound? *Br J Radiol*. 2017;90:20160920.