Prevalence of Torticollis and Plagiocephaly in Children Later Diagnosed with Autism: A Scoping Review

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Abstract

Background: Early motor developmental differences are being recognized as a potential early sign in children later diagnosed with autism spectrum disorder (ASD). Common pediatric musculoskeletal conditions, such as torticollis and plagiocephaly, may be associated with early gross motor developmental differences, the extent of their association with autism remains unclear.

Objective: This scoping review aims to map the existing body of literature on the prevalence and clinical presentation of torticollis and plagiocephaly in children later diagnosed with autism, as well as to identify the gaps in current research.

Methods: With library scientist counsel, search terms were identified, and five databases were searched for articles examining torticollis and/or plagiocephaly in children later diagnosed with autism. Articles were managed in the Covidence Systematic Review Management Software. Researchers independently screened articles for inclusion and extracted data from included studies. Descriptive data analysis was conducted.

Results: Seven articles met the inclusion criteria. The included studies were heterogeneous in design, population characteristics, and diagnostic criteria. Overall findings suggest a potentially increased frequency of later neurodevelopmental diagnosis, including autism, in children with an early diagnosis of torticollis and plagiocephaly. However, inconsistencies in reported data, limitations in prospective data, and study heterogeneity limited definitive conclusions.

Conclusions: This scoping review highlights the potential association between early musculoskeletal conditions, such as torticollis and plagiocephaly, and a later autism diagnosis, while also underscoring significant gaps in current literature. The findings highlight the importance of frequent early developmental surveillance, particularly in children with postural asymmetries and cranial deformities. Future research should prioritize prospective longitudinal designs and standardize measures and diagnostic criteria to help further understanding of early musculoskeletal diagnoses and gross motor development, and their relationship to autism.

Keywords: Autism; Plagiocephaly; Torticollis

Background and Purpose

Torticollis and plagiocephaly are among the most common musculoskeletal conditions observed in infancy, with reported incidence rates of approximately 0.3-2% and 15-20%, respectively.[1,2] Torticollis is characterized by unilateral shortened neck musculature, most notably the sternocleidomastoid, resulting in a persistent head tilt and rotation posturing. Plagiocephaly involves asymmetrical cranial shaping, typically associated with positional preferences or prolonged supine positioning. Both conditions have been associated with abnormal early gross motor development and postural control, and impact overall neurodevelopmental trajectories. Pediatric care providers have stressed the importance of early identification and intervention for these conditions to facilitate typical motor development and prevent secondary complications.

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by differences in social communication and restricted or repetitive behaviors. Autism prevalence rates are steadily increasing, with an estimated global prevalence of approximately 1 in 100 children being diagnosed with ASD.[3] Early diagnosis of autism is associated with earlier intervention and improved long-term developmental outcomes. Recent research by da Silva et al. has identified associations between abnormal early motor development and the later development of autism.[4] Characteristics of motor development in children later diagnosed with autism include decreased complexity of movements performed, decreased postural control, and overall delays in gross motor development.[4] Additionally, research has shown that children with autism often exhibit atypical motor patterns, impaired postural control, coordination difficulties, and delays in the development of gross and fine motor skills.[5]

With the increasing emphasis on early diagnosis of ASD, there has been a growing interest in early motor development as a potential early indicator of a later autism diagnosis. The gross motor developmental differences seen in children with torticollis and plagiocephaly have shared clinical features with the atypical motor development often seen in children with autism. These shared clinical features include impaired postural control, asymmetrical movement patterns, reduced prone positioning tolerance, and delayed development of motor skills. This raises the question of a potentially increased occurrence of torticollis and plagiocephaly in children with ASD. Existing studies examining the potential associations between these diagnoses are varied in design, methodology, and outcome reporting, and the evidence has not been comprehensively

synthesized. A scoping review is warranted to provide a comprehensive synthesis of the existing literature on the prevalence of torticollis and plagiocephaly in children later diagnosed with autism. The objective of this scoping review is to systematically map and synthesize the existing literature on the prevalence of torticollis and plagiocephaly in infants and young children who are later diagnosed with autism spectrum disorder, and to identify gaps in the current evidence base.

Methods

A scoping review was conducted following the framework presented by Arksey and O'Malley as updated by Levac et al.[6] This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews checklist (PRISMA-ScR).[7]

Data Sources and Search Strategy

A health sciences librarian (BH) conducted literature searches on February 6, 2026. The following databases were queried: Ovid MEDLINE(R) ALL (1946 to search date); Embase (Embase.com, 1974 to search date); Web of Science Core Collection (1974- to search date); ProQuest Dissertations & Theses A&I (1743 to present); Google Scholar (first 100 citations) retrieved via Harzing, A.W. (2007) Publish or Perish, available from https://harzing.com/resources/publish-or-perish. Editorials and letters were excluded from Embase and Web of Science, with clinical trials additionally excluded in Embase. No other limits were applied.

281 total citations were retrieved. All retrieved records were de-duplicated and organized using the citation management software EndNote 2025. After de-duplication, 231 citations were then uploaded to Covidence, a systematic review citation reviewing and screening software. Covidence detected no additional duplicates, leaving 231 citations for initial title/abstract screening. One citation was identified as a duplicate during screening.

The search strategy was designed to capture the concepts of torticollis and plagiocephaly in children who were later diagnosed with autism. See online supplementary material for full search strategies.

Eligibility Criteria

This review included research articles that examined the prevalence of torticollis and/or plagiocephaly in children later diagnosed with Autism Spectrum Disorder (ASD). Torticollis was defined as a congenital or acquired shortening or imbalance of the sternocleidomastoid muscle resulting in head tilt and rotation. Plagiocephaly was defined as a positional or deformational cranial asymmetry identified in infancy. Studies were eligible if they reported prevalence, incidence, frequency, or sufficient data to calculate the proportion of torticollis and/or plagiocephaly among children with a confirmed ASD diagnosis. We included observational study designs (cohort, case-control, cross-sectional, registry-based, and retrospective or prospective chart reviews) involving human participants from birth through 18 years of age.

Articles were excluded if they did not include participants with ASD or did not provide extractable prevalence data specific to the ASD population. Studies were also excluded if cranial asymmetry was attributable to genetic syndromes, craniosynostosis, neuromuscular disorders, or other structural or organic conditions unrelated to positional plagiocephaly or typical congenital muscular torticollis. Case reports with fewer than five participants, gray literature, conference abstracts, review articles, editorials, and studies not published in English were excluded. No restrictions were placed on publication year in order to capture the full scope of literature examining early musculoskeletal conditions among children later diagnosed with ASD.

Article Selection

Screening for article eligibility occurred in two steps: title and abstract review, and full-text review. Authors M.S. and E.P. both independently screened all tiles and abstracts to screen for potential inclusion through the application of the pre-defined inclusion and exclusion criteria. Next, the same authors independently read the included full-text articles to assess eligibility for final inclusion. Conflicts were resolved via author M.H.

Data Extraction

A data extraction tool was developed based on the Joanna Briggs Institute (JBI) extraction template but adapted for the given research questions. Author M.S. utilized the tool to independently extract relevant data in Covidence.[8]

Results

Search Outcomes

Following the removal of duplicates, 231 citations were imported for screening. The screening process yielded 7 articles to include for final data extraction and analysis (Figure 1).

Characteristics of Included Articles

The review sample was variable (Table 1) and included cohort studies (4)[9-12], cross-sectional studies (1)[13], retrospective chart reviews (1)[14], and case-control studies[9] (1). All articles were published within the past 15 years, with 6 being published within the last 4 years. Geographic representation included Canada (1)[14], the Netherlands (1)[9], Israel (3)[10,12,15], the United States (1)[11], and Italy (1)[13].

Data reported from the included articles were variable (Table 2). Two reported data on torticollis, four reported data on plagiocephaly, and one reported on combined torticollis/plagiocephaly data.

Reported Torticollis Data

Two articles reported on the prevalence of torticollis in patients later diagnosed with autism.[10,15] Kochav-Lev et al. reported that 19.52% of children with a later diagnosis of autism were referred for physical therapy with a diagnosis of torticollis.[15] Schertz. et al. reported that 32-44% of

children with a history of congenital muscular torticollis were found to have a developmental disorder.[10] It is to be noted that in the Shertz et al. study, only 1 of the 73 children included had a diagnosis of autism.[10]

Reported Plagiocephaly Data

Three articles reported on the prevalence of plagiocephaly in patients later diagnosed with autism.[9,11,13] Di Renzo et al.'s study reported 48% of the included children with autism were diagnosed with positional plagiocephaly.[13] 2.2% of children with a diagnosis of plagiocephaly went on to receive a later autism diagnosis per Lynch et al.[11] Additionally, children with more severe forms of plagiocephaly, as identified by a Radial Symmetry Index (RSI) grade of 5, had an increased prevalence of neurodevelopmental disorders.[11] 5.7% of children with an RSI grade of 5 were diagnosed with neurodevelopmental disorders, including autism.[11] Ambrosino et al. reported 1.7% of children in the autistic group were found to have plagiocephaly compared to 1.1% of children in the typically developing group.[9] When looking at all cranial deformities, the autistic group had a 6% prevalence rate compared to 2.6% in the typically developing group.[9] This higher incidence failed to reach significance after statistical correction for multiple comparisons.[9] Gurevitz et al.'s study reported equal rates of referral to physical therapy in both autistic and typically developing groups.[12] They attributed the overall increased rates of plagiocephaly to the American Academy of Pediatrics "Back to Sleep" guidelines.[12]

Reported Combined Torticollis/Plagiocephaly Data

One study reported a combined rate of torticollis and plagiocephaly prevalence.[14] 5.94% of autistic children in Burns et al.'s study had a diagnosis of torticollis and/or plagiocephaly.[14] This article did not report the specific prevalence of plagiocephaly, but did note multiple participants having plagiocephaly or brachycephaly.[14]

Reported Autism Data

Five studies reported the diagnostic criteria or diagnostic tool used to diagnose autism in their study.[9,10,12,13,15] Two studies reported using the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) criteria to diagnose autism.[10,12] One study used the DSM-V criteria.[14] One study reported utilizing ICD-10 codes of an autism diagnosis within participants' medical records.[15] The Autism Diagnostic Observation Schedule (ADOS) was utilized in one study.[13] One study also reported the use of the updated ADOS-2.[14] Gender distributions of autistic participants were reported in 5 studies.[9,11-14] All studies with reported gender data reported a higher percentage of male participants, with reported percentages ranging from 64.9% to 90%.[11,13]

Reported Gross Motor Development in Autism

Multiple articles discussed the association between atypical early gross motor development and autism.[12,14,15] While Gurevitz et al. reported no increase in PT referrals for autistic versus typically developing children, they did discuss that previous research has found significant gross and fine motor delays in children with a later autism diagnosis.[12] They also recommend that all children might benefit from early motor interventions to prevent the development of torticollis, plagiocephaly, or motor delays. Increased rates of hypotonia (5.7%) in autistic children were seen by Burns et al.'s study.[14] They discussed how previous research has found links between hypotonia and autism and discussed the utilization of hypotonia as a potential "red flag" symptom.[14] An odds ratio of 4.1 for autism was found in children with a history of developmental delay by Kochav-Lev et al.[15] Additionally, in this study, 45% of children with a later ASD diagnosis had an Alberta Infant Motor Scales score below the 5th percentile.[15] A score at the 5th percentile at 8 months of age is considered to be a cut-off score for abnormal motor development.[16]

Discussion and Conclusion

This scoping review aimed to investigate the prevalence of earlier diagnoses of torticollis and plagiocephaly in children with autism. Overall, the findings suggest that an early diagnosis of musculoskeletal conditions, including torticollis and plagiocephaly, may be associated with a later neurodevelopmental diagnosis such as autism. Across the included studies, there was noted variability in study design, diagnostic criteria used, and reporting methods, which limited the ability for direct comparison, however it did highlight emerging patterns.

Several studies discussed the prevalence of an early diagnosis of torticollis and/or plagiocephaly in children later diagnosed with autism. There was also a connection found between increased plagiocephaly severity and increased likelihood of a later neurodevelopmental diagnosis, including autism. As described previously, torticollis and plagiocephaly may be associated with early disruptions in motor development. This may suggest that early postural asymmetries and cranial shape abnormalities could be components of the overall pattern of motor developmental differences associated with autism. The extent of these associations remains unclear due to the variability in how these conditions were diagnosed and reported.

An important consideration is whether torticollis and plagiocephaly may lead to earlier interactions with the healthcare system through services such as physical therapy. Earlier experiences with healthcare professionals may lead to more frequent surveillance and potentially earlier referrals to specialists, ultimately leading to an earlier autism diagnosis.

Limitations

This scoping review has several limitations. First, consistent with the nature of a scoping review, this review covers the breadth of available literature and does not critically appraise study quality. Second, the overall body of available literature on this topic is limited. This limited evidence sample constrained the ability to draw definitive conclusions or identify clear patterns.

Third, while the search study was comprehensive, it may not have captured all relevant studies. Having a search restricted to selected databases and only including articles available in English creates the potential for publication and language bias. Additionally, gray literature was not searched, which may increase the risk of publication bias and reduce the comprehensiveness of the literature sample. Fourth, heterogeneity across included studies limited the possibility for direct comparison and synthesis of findings. Finally, there was a potential for error with manual data extraction and examination. This was controlled, however, using the established software, Covidence.

Implications for Future Research and Practice

In reviewing the included articles, multiple gaps in the evidence were identified that should guide future research. First, given the limited and heterogeneous body of current literature, there is a clear need for further studies examining the relationship between early musculoskeletal diagnoses, such as torticollis and plagiocephaly, and the later diagnosis of autism. Prospective longitudinal studies on developmental outcomes in children with torticollis and plagiocephaly are needed. Such studies should aim to provide a better understanding of potential long-term complications, including whether these conditions can be early markers of autism spectrum disorder.

Additionally, there is a need to better identify potential mechanisms underlying observed associations between torticollis and plagiocephaly and autism. Studies looking at altered muscle tone, sensory processing differences, early motor asymmetries, and altered postural control can help clarify whether there are common developmental pathways contributing to both diagnoses.

Finally, future research should examine the role of early screening and intervention pathways. Studies evaluating whether infants with torticollis or plagiocephaly are more likely to receive developmental interventions and whether this influences the timing of autism diagnosis would provide important information regarding opportunities for earlier identification.

These findings have important implications for clinical practice. Early diagnosis of torticollis and plagiocephaly may provide opportunities for increased developmental monitoring. Pediatric healthcare providers, specifically physical therapists and pediatricians, should consider incorporating broader developmental screenings for patients with these conditions.

In summary, this scoping review illustrates a potential association between early musculoskeletal conditions, specifically torticollis and plagiocephaly, and a later autism diagnosis. The findings of this review underscore the significant gaps in the current literature and emphasize the need for future research to better understand early motor development in children with autism. These findings support the role of pediatric healthcare providers in conducting regular developmental assessments, particularly in children with identified early postural and cranial asymmetries.

Keywords: Autism; Plagiocephaly; Torticollis

Figure 1 – PRISMA

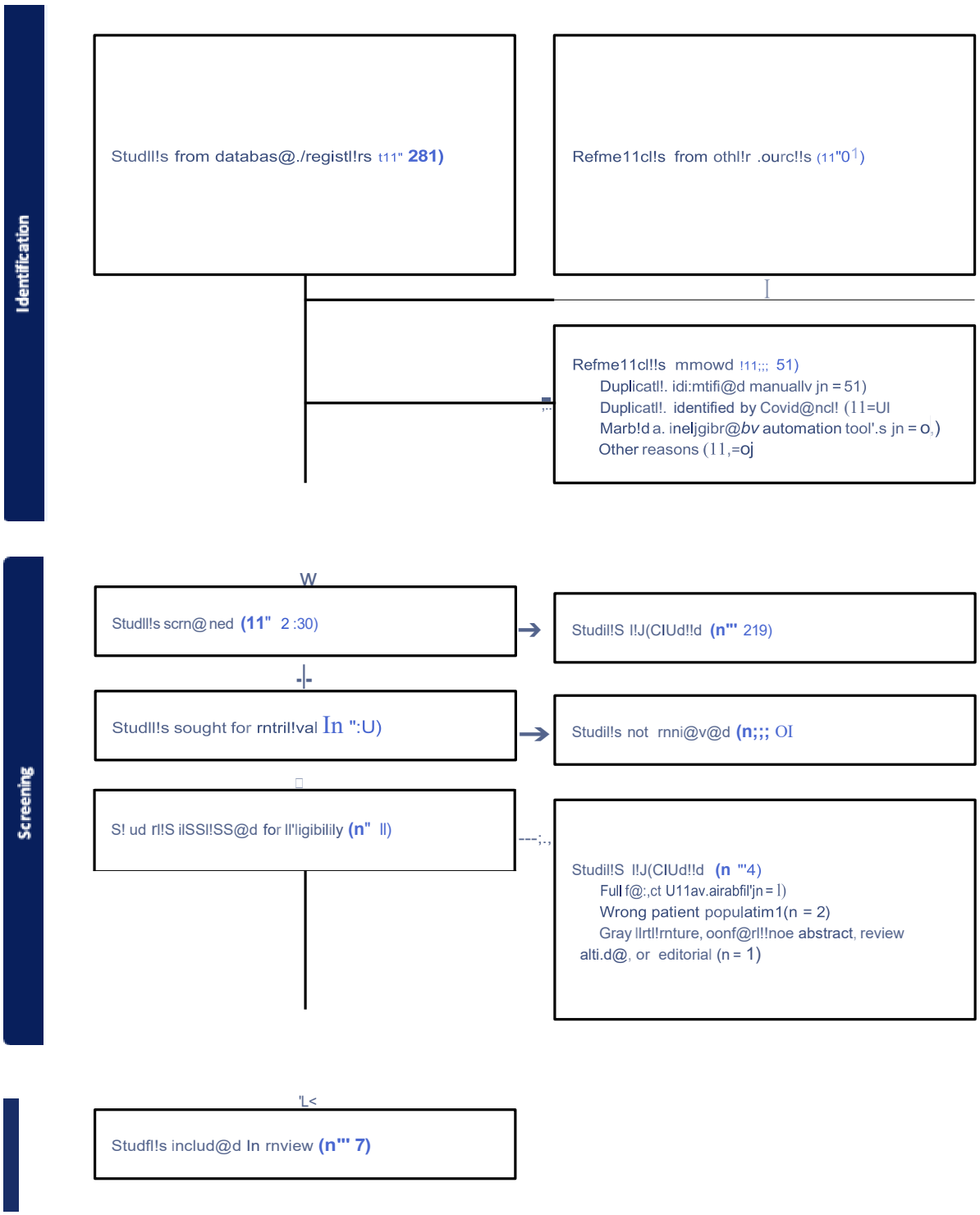

Table 1 – Study Characteristics

Characteristic	**Count (%)**
Year of Publication	
2012	1 (14%)
2022	2 (29%)
2023	3 (43%)
2024	1 (14%)
Country	
Canada	1 (14%)
Netherlands	1 (14%)
Israel	3 (43%)
United States	1 (14%)
Italy	1 (14%)
Article Type	
Retrospective Chart Review	1 (14%)
Case Control Study	1 (14%)
Cohort Study	4 (57%)
Cross Sectional Study	1 (14%)

Table 2 – Evidence Mapping

Study	**Torticollis Reported**	**Plagiocephaly Reported**	**Combined Torticollis/Plagiocephaly Reported**
Ambrosino et al., 2022	✗	✓	✗
Burns et al., 2023	✗	✗	✓
Kochav-Lev et al., 2023	✓	✗	✗
Lynch et al., 2024	✗	✓	✗
Di Renzo et al., 2022	✗	✓	✗
Gurevitz et al., 2023	✗	✓	✗
Schertz et al., 2013	✓	✗	✗
Note. ✓ = reported; ✗ = not reported.			

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