ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 3| March2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

DEVELOPMENTAL DYSPLASIA OF THE HIP IN THE PEDIATRIC POPULATION: DIAGNOSIS AND MANAGEMENT

Karentts Julissa Hernández Roldán[1], Jennifer Paola Acosta Cuenca[2]
Yerlyn Narcisa Villacis Hidalgo[3], Gabriela Patricia Velasco Castro[4]
Lenny Mariel Jaramillo Briceño[5], Melany Patricia Bolagay Apráez[6]
Bryam Esteban Coello García[7]

[1]*General Practitioner in Independent Practice, Faculty of Medical Sciences, Universidad UTE ORCID https://orcid.org/0009-0007-5470-4467*
[2]*General Practitioner at "Hospital Básico de Cayambe", Faculty of Medical Sciences, Universidad Central del Ecuador ORCID https://orcid.org/0000-0003-1516-9223*
[3]*General Practitioner in independent practice, faculty of Medical Sciences, Universidad Católica Santiago de Guayaquil. Ecuador ORCID https://orcid.org/0009-0003-7409-3000*
[4]*General Practitioner in Independent Practice,Faculty of Medical Sciences, Universidad UTE ORCID https://orcid.org/0009-0003-5296-4610*
[5]*General Practitioner at "PraxMed", Faculty of Medical Sciences, Universidad UTE ORCID https://orcid.org/0009-0001-9148-0892*
[6]*General Practitioner in Independent Practice,Faculty of Medical Sciences, Universidad UTE ORCID https://orcid.org/0009-0003-2948-9663*
[7]*Orthopedic Surgeon and Traumatologist, Fellow in Advanced Hip Surgery, Faculdade Moinhos de Vento. Porto Alegre – Brasil. ORCID https://orcid.org/0000-0003-2497-0274*

Corresponding Author: *Bryam Esteban Coello García,* ***Address:*** *Rua General Neto,118- Moinhos de Vento. Porto Alegre. Brasil,****Postal Code:*** *90560-020*

Article DOI: https://doi.org/10.36713/epra26480
DOI No: 10.36713/epra26480

ABSTRACT

Introduction: *developmental dysplasia of the hip (DDH) is a common pediatric musculoskeletal disorder that includes a spectrum of abnormalities ranging from acetabular dysplasia to complete hip dislocation.*
Objective: *to describe current information related to developmental dysplasia of the hip, including its etiology, classification, imaging findings, and management.*
Methodology: *this review analyzed 32 articles, including review articles, original studies, and clinical case reports. From these, 21 references were selected based on their relevance to the objectives of the study. The databases used were PubMed, Google Scholar, and Cochrane Library. The search terms used in Spanish, Portuguese, and English included: developmental dysplasia of the hip, hip dysplasia, DDH, diagnosis, screening, and treatment.*
Results: *early clinical screening and imaging evaluation, particularly ultrasound in infants, are essential for the timely diagnosis of DDH. Conservative treatment with the Pavlik harness shows high success rates in achieving stable hip reduction.*
Conclusions: *early diagnosis and appropriate management are crucial to ensure normal hip development and prevent long-term complications.*
KEYWORDS: *Developmental Dysplasia of The Hip; Hip Dysplasia; Ultrasound; Pavlik Harness.*

INTRODUCTION

Developmental dysplasia of the hip (DDH) encompasses a group of disorders characterized by abnormal development of the hip joint during the neonatal period and early childhood. This condition includes a spectrum of abnormalities ranging from mild hip instability and acetabular dysplasia to subluxation or complete dislocation of the hip. The term replaced the former designation congenital hip dislocation, as many of these abnormalities are not always present or detectable at birth.

The etiopathogenesis of DDH is multifactorial, involving the interaction of genetic, mechanical, and environmental factors, with evidence of familial aggregation and the identification of several associated genetic loci.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 3| March2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

Diagnosis is based on early clinical evaluation, including physical examination maneuvers such as the Ortolani and Barlow tests, as well as the identification of indirect signs such as limited hip abduction, asymmetry of skin folds, or limb length discrepancy. Suspicious findings should be confirmed with imaging studies, primarily ultrasound in infants and radiography in older children.

Early diagnosis and prompt treatment are essential to prevent long-term complications, including persistent hip dislocation, abnormal acetabular development, and early hip osteoarthritis. Treatment depends on the patient's age and the severity of the condition, and may include conservative management with braces or orthoses, as well as surgical intervention in more advanced cases(1–3).

METHODOLOGY

This study was conducted as a narrative literature review on developmental dysplasia of the hip (DDH). A comprehensive search of the scientific literature was performed using the electronic databases PubMed, Cochrane Library, and Google Scholar.

The search strategy included articles published in Spanish, English, and Portuguese, using the following keywords and their combinations: *developmental dysplasia of the hip*, *hip dysplasia*, *DDH*, *hip instability*, *diagnosis*, *screening*, *treatment*, and *Pavlik harness*.

A total of 32 articles were initially identified, including review articles, original studies, clinical trials, and case reports. After evaluating relevance and scientific quality, 21 studies were selected for inclusion in the present review, while the remaining articles were excluded due to limited relevance to the objectives of the study.

The selected literature was analyzed to summarize the epidemiology, risk factors, pathophysiology, clinical presentation, diagnostic methods, and current management strategies for developmental dysplasia of the hip.

DEVELOPMENT

Epidemiology

The incidence of developmental dysplasia of the hip (DDH) is estimated at approximately 10 per 1,000 live births, with hip dislocation occurring in about 1 per 1,000 newborns. The prevalence varies according to ethnic background, age at diagnosis, and diagnostic methods, being higher in some populations and less frequent in others.

DDH represents a spectrum of hip abnormalities, ranging from mild instability that may resolve spontaneously to complete dislocation requiring surgical management. Although early ultrasound screening may detect a higher number of cases, many resolve spontaneously during the first weeks of life, leaving a smaller proportion that requires treatment.
Unilateral involvement is more common, with a predominance of the left hip, which has been associated with the typical intrauterine fetal position, potentially leading to mechanical restriction during hip development(3–5).

Risk Factors

Several risk factors have been associated with an increased likelihood of developmental dysplasia of the hip (DDH) and should prompt careful clinical screening. Female sex is one of the strongest predictors, with an incidence approximately four times higher than in males, likely related to ligamentous laxity induced by maternal hormones. Breech presentation, particularly during the third trimester, represents one of the most significant risk factors, as it may increase mechanical stress on the developing hip joint. A positive family history also contributes to susceptibility, suggesting a genetic component, with several genes implicated in hip development and joint stability(6,7).

Additional contributing factors include postnatal swaddling in adduction and extension, which may restrict normal hip positioning, and intrauterine mechanical constraints, such as large fetal size, oligohydramnios, or multiple gestations, which can limit fetal mobility and affect hip formation. Furthermore, post-term gestation has been associated with a higher risk of DDH, whereas prematurity does not appear to significantly increase its incidence(8).

Pathophysiology

The development of the hip joint relies on the proper interaction between the femoral head and the acetabulum during fetal growth and early infancy. Disruption of this relationship can lead to developmental dysplasia of the hip (DDH).

Embryologically, the hip joint begins forming around the fourth week of gestation, with progressive differentiation of the femoral head and acetabulum. As development continues, the femoral head grows more rapidly than the acetabulum, resulting in relatively limited coverage. Any alteration in their alignment may cause acetabular dysplasia, instability, subluxation, or dislocation.

Chronic changes, including capsular hypertrophy and acetabular rim thickening (neolimbus), may further hinder normal joint congruence and complicate reduction of the femoral head(9).

Diagnosis and Screening

The clinical presentation of developmental dysplasia of the hip (DDH) varies with age, ranging from mild hip instability and limited abduction in infants to asymmetric gait, hip pain in adolescence, and early osteoarthritis in adulthood. For this reason, organizations such as the American Academy of Pediatrics, American Academy of Orthopaedic Surgeons, and Pediatric Orthopaedic Society of North America recommend routine neonatal screening.

Diagnosis initially relies on clinical examination, particularly the Ortolani and Barlow maneuvers, which assess hip stability and the presence of dislocation. These tests have high sensitivity and specificity when performed by experienced clinicians. Additional findings such as limited hip abduction, asymmetric skin folds, limb length discrepancy, or a positive Galeazzi sign may also raise suspicion.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 3| March2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

When DDH is suspected, imaging studies are essential. Ultrasound is the preferred modality during the first six months of life, while radiography becomes more reliable after the appearance of the femoral head ossification center (around 4–6 months)(10–12). Early detection through systematic screening and periodic surveillance during infancy is critical to prevent delayed diagnosis and long-term complications. Ultrasound is the preferred imaging method for evaluating developmental dysplasia of the hip (DDH) in early infancy because it allows visualization of cartilaginous structures. It assesses acetabular morphology, femoral head position, and joint structures. Key parameters include femoral head coverage by the acetabulum (≥50%) and the alpha angle, which reflects acetabular depth and is considered normal when greater than 60°. The beta angle, related to the labrum, is normally less than 55°, according to the Graf classification of developmental dysplasia of the hip.

The Graf classification is widely used to categorize hip development based on ultrasound measurements of the alpha and beta angles. It classifies hips into types I to IV, ranging from normal development to complete dislocation. This classification helps determine the severity of dysplasia and guides treatment decisions.

In older infants and children, radiography becomes more useful for evaluating hip alignment. Several reference lines help identify abnormalities, including the Hilgenreiner line, the Perkin line, and the Shenton line, whose disruption may indicate displacement of the femoral head. Additional measurements such as the acetabular index and the Wiberg center-edge angle are also used to assess acetabular development and femoral head coverage(13,14).

Treatment

The management of developmental dysplasia of the hip (DDH) aims to restore and maintain a stable and concentric relationship between the femoral head and the acetabulum, allowing normal joint development. Treatment is based on three fundamental principles: reduction of the femoral head, stabilization within the acetabulum, and promotion of acetabular maturation. Early intervention is essential, as outcomes improve significantly when treatment is initiated during early infancy.

Therapeutic strategies depend on patient age and the degree of hip displacement. In cases of mild acetabular dysplasia with a centered femoral head, observation and measures that promote adequate hip abduction with close clinical and imaging follow-up may be sufficient. However, when hip decentering or instability is present, active treatment is required to achieve and maintain reduction.

In infants younger than six months, abduction orthoses are the first-line treatment, particularly the Pavlik harness, which maintains the hips in approximately 90° flexion and 45–60° abduction, promoting stable reduction. When properly indicated and monitored, success rates exceed 90%. If reduction is not achieved after several weeks, alternative strategies are required(15,16).

For patients between 6 and 18 months, closed reduction under anesthesia followed by spica casting is commonly performed to maintain hip stability. In cases where closed reduction fails or in older children, open reduction may be necessary to correct anatomical obstacles such as capsular tightness, hypertrophy of the ligamentum teres, or labral inversion. Surgical approaches commonly include anterolateral or medial techniques, sometimes combined with procedures such as capsulorrhaphy or tendon release.

In persistent acetabular dysplasia, especially in older children, pelvic osteotomies may be indicated to improve femoral head coverage. Procedures such as the Salter osteotomy, Pemberton osteotomy, or Dega osteotomy are commonly used. In adolescents or young adults with symptomatic dysplasia but preserved joint cartilage, joint-preserving procedures, such as the Bernese periacetabular osteotomy, may be considered to restore acetabular coverage and delay degenerative changes(17–19).

Differential Diagnosis, Prognosis, and Complications

The differential diagnosis of developmental dysplasia of the hip (DDH) includes other conditions that may cause lower limb length discrepancy, such as proximal femoral focal deficiency, femoral neck fracture, coxa vara, and sequelae of septic arthritis. The prognosis largely depends on the severity of dysplasia, age at diagnosis, treatment method, and the achievement of a stable concentric hip reduction. In many neonates with mild instability, spontaneous resolution may occur, whereas treatment with the Pavlik harness achieves high rates of successful reduction, although residual dysplasia may persist in some cases. Early detection and timely management are essential to prevent long-term complications such as functional impairment, chronic hip pain, and early osteoarthritis. Potential complications include avascular necrosis of the femoral head, transient femoral nerve palsy, skin irritation, and residual dysplasia, while surgical treatment may be associated with redislocation, infection, osteonecrosis, and joint stiffness. Therefore, long-term clinical and radiographic follow-up until skeletal maturity is recommended(20,21).

Prevention

Preventive strategies include proper swaddling techniques that allow free hip movement and early neonatal screening in infants with risk factors such as breech presentation or positive family history. Educational programs for parents and healthcare professionals are essential to reduce late diagnosis**.**

CONCLUSION

Developmental dysplasia of the hip (DDH) represents an important pediatric orthopedic disorder with potentially serious long-term consequences if not recognized and treated early. Early identification through systematic clinical examination and appropriate imaging methods, particularly ultrasound during infancy, is essential for accurate diagnosis. Classification systems such as the Graf classification help determine the severity of the condition and guide treatment strategies. Conservative management with the Pavlik harness remains the first-line therapy in most infants and demonstrates high rates of successful hip reduction. Early diagnosis and timely intervention are critical to ensure normal hip

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 12| Issue: 3| March2026|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2026: 8.753 || ISI Value: 1.188

development, minimize complications, and reduce the risk of premature degenerative joint disease.

BIBLIOGRAPHY

1. *Alhaddad A, Gronfula AG, Alsharif TH, Khawjah AA, Alali MY, Jawad KM. An Overview of Developmental Dysplasia of the Hip and Its Management Timing and Approaches. Cureus. 2023 Sep;15(9):e45503. doi:10.7759/cureus.45503 PubMed PMID: 37868507; PubMed Central PMCID: PMC10585185.*
2. *Escribano García C, Bachiller Carnicero L, Marín Urueña SI, Del Mar Montejo Vicente M, Izquierdo Caballero R, Morales Luengo F, et al. Developmental dysplasia of the hip: Beyond the screening. Physical exam is our pending subject. An Pediatría Engl Ed. 2021 Oct;95(4):240–5.doi:10.1016/j.anpede.2020.07.024*
3. *Dwan K, Kirkham J, Paton RW, Morley E, Newton AW, Perry DC. Splinting for the non-operative management of developmental dysplasia of the hip (DDH) in children under six months of age. Cochrane Database Syst Rev. 2022 Oct 10;10(10):CD012717. doi:10.1002/14651858.CD012717.pub2 PubMed PMID: 36214650; PubMed Central PMCID: PMC9549867.*
4. *Loder RT, Skopelja EN. The epidemiology and demographics of hip dysplasia. ISRN Orthop. 2011;2011:238607. doi:10.5402/2011/238607 PubMed PMID: 24977057; PubMed Central PMCID: PMC4063216.*
5. *Kokavec M, Bialik V. Developmental dysplasia of the hip. Prevention and real incidence. Bratisl Lek Listy. 2007;108(6):251–4. PubMed PMID: 17972535.*
6. *Lehmann HP, Hinton R, Morello P, Santoli J. Developmental dysplasia of the hip practice guideline: technical report. Committee on Quality Improvement, and Subcommittee on Developmental Dysplasia of the Hip. Pediatrics. 2000 Apr;105(4):E57. doi:10.1542/peds.105.4.e57 PubMed PMID: 10742378.*
7. *Stevenson DA, Mineau G, Kerber RA, Viskochil DH, Schaefer C, Roach JW. Familial predisposition to developmental dysplasia of the hip. J Pediatr Orthop. 2009;29(5):463–6. doi:10.1097/BPO.0b013e3181aa586b PubMed PMID: 19568018.*
8. *Orak MM, Onay T, Gümüştaş SA, Gürsoy T, Muratlí HH. Is prematurity a risk factor for developmental dysplasia of the hip? : a prospective study. Bone Jt J. 2015 May;97-B(5):716–20. doi:10.1302/0301-620X.97B5.34010 PubMed PMID: 25922469.*
9. *Litrenta J, Masrouha K, Wasterlain A, Castaneda P. Ultrasound Evaluation of Pediatric Orthopaedic Patients. J Am Acad Orthop Surg. 2020 Aug 15;28(16):e696–705. doi:10.5435/JAAOS-D-17-00895 PubMed PMID: 32769718.*
10. *Faria TGD, Morais APCD, Abreu EBRD, Pires LDBM, Sena TL. Displasia do desenvolvimento do quadril - uma revisão de literatura. Braz J Health Rev. 2024 Aug 6;7(4):e71699. doi:10.34119/bjhrv7n4-196*
11. *Jones DA. Neonatal hip stability and the Barlow test. A study in stillborn babies. J Bone Joint Surg Br. 1991 Mar;73(2):216–8. doi:10.1302/0301-620X.73B2.2005142 PubMed PMID: 2005142.*
12. *Bond CD, Hennrikus WL, DellaMaggiore ED. Prospective evaluation of newborn soft-tissue hip "clicks" with ultrasound. J Pediatr Orthop. 1997;17(2):199–201. doi:10.1097/00004694-199703000-00011 PubMed PMID: 9075095.*
13. *American Institute of Ultrasound in Medicine, American College of Radiology. AIUM practice guideline for the performance of an ultrasound examination for detection and assessment of developmental dysplasia of the hip. J Ultrasound Med Off J Am Inst Ultrasound Med. 2009 Jan;28(1):114–9. doi:10.7863/jum.2009.28.1.114 PubMed PMID: 19106370.*
14. *Jacobino BDCP, Galvão MD, Silva AFD, Castro CCD. Using the Graf method of ultrasound examination to classify hip dysplasia in neonates. Autopsy Case Rep. 2012;2(2):5–10. doi:10.4322/acr.2012.018*
15. *Larson JE, Patel AR, Weatherford B, Janicki JA. Timing of Pavlik Harness Initiation: Can We Wait? J Pediatr Orthop. 2019 Aug;39(7):335–8. doi:10.1097/BPO.0000000000000930 PubMed PMID: 31305375.*
16. *Vadillo P, Encinas-Ullan CA, Moraleda L, Albiñana J. Results of the Pavlik harness when treating Ortolani-positive hips: predictors of failure and arthrographic findings. J Child Orthop. 2015 Aug;9(4):249–53. doi:10.1007/s11832-015-0666-8 PubMed PMID: 26149424; PubMed Central PMCID: PMC4549343.*
17. *Race C, Herring JA. Congenital dislocation of the hip: an evaluation of closed reduction. J Pediatr Orthop. 1983 May;3(2):166–72. doi:10.1097/01241398-198305000-00004 PubMed PMID: 6863522.*
18. *Kamath AF. Bernese periacetabular osteotomy for hip dysplasia: Surgical technique and indications. World J Orthop. 2016 May 18;7(5):280–6. doi:10.5312/wjo.v7.i5.280 PubMed PMID: 27190755; PubMed Central PMCID: PMC4865717.*
19. *Raimann R, Aguirre D. DISPLASIA DEL DESARROLLO DE LA CADERA: TAMIZAJE Y MANEJO EN EL LACTANTE. Rev Médica Clínica Las Condes. 2021 May;32(3):263–70. doi:10.1016/j.rmclc.2021.04.003*
20. *Barlow TG. EARLY DIAGNOSIS AND TREATMENT OF CONGENITAL DISLOCATION OF THE HIP. Proc R Soc Med. 1963 Sep;56(9):804–6. doi:10.1177/003591576305600920 PubMed PMID: 14080075; PubMed Central PMCID: PMC1897214.*
21. *Schaeffer E, Lubicky J, Mulpuri K. AAOS Appropriate Use Criteria: The Management of Developmental Dysplasia of the Hip in Infants up to Six Months of Age: Intended for Use by Orthopaedic Specialists. J Am Acad Orthop Surg. 2019 Apr 15;27(8):e369–72. doi:10.5435/JAAOS-D-18-00499 PubMed PMID: 30418271.*

Conflict of Interest Statement

The authors report no conflicts of interest.

Funding

The authors report no funding from any organization or company.