Check for updates

OPEN ACCESS

DOI: 10.46903/gjms/24.1.2149

ORIGINAL ARTICLE

CLINICAL OUTCOMES AND SURGICAL MANAGEMENT OF DEVELOPMENTAL DYSPLASIA OF THE HIP (DDH): A SINGLE-CENTER EXPERIENCE WITH DEGA OSTEOTOMY

Abbas Ali[1], Mudir Khan[1], Sikandar Hayat[1], Rao Erbaz khan[1], Jawad Ali[1], Zeeshan khan[1], Hamza Haroon[2]

Departments of Pediatric Orthopedics, [1]Khyber Teaching Hospital (KTH), Peshawar, [2]Lady Reading Hospital (LRH), Peshawar, Pakistan

ABSTRACT:

Background: Developmental Dysplasia of the Hip (DDH) is a significant pediatric orthopedic condition with long-term implications for hip function and mobility. This study aimed to evaluate the clinical outcomes and effectiveness of surgical management, focusing on the Dega osteotomy technique.

Materials & Methods: This retrospective single-center study included 35 patients (49 operated hips) who underwent Dega osteotomy for DDH between January 2020 and December 2024. Demographic, clinical, and surgical data were collected, and functional outcomes were assessed using standardized measures.

Results: The mean age at diagnosis was 1.84 years (±1.2). Dega osteotomy was the most frequently performed procedure (62.9%), often combined with other interventions. Postoperative outcomes were favorable, with 82.9% of patients reporting no or minor pain. Functional outcomes showed that 97.1% of patients did not require mobility support, 77.1% exhibited no limp, and 85.7% could walk unlimited distances. Statistically significant associations were observed between the number of surgeries and hip involvement ($p = 0.000$), type of harness used ($p = 0.032$), type of operation ($p = 0.016$), pain levels ($p = 0.042$), and walking distance ($p = 0.041$).

Conclusions: The Dega osteotomy, often combined with other procedures, demonstrated effective surgical management of DDH in this single-center experience. Favorable functional outcomes, including improved mobility and reduced pain, were achieved in the majority of patients. These findings underscore the importance of early diagnosis and tailored interventions to optimize long-term outcomes for DDH patients.

KEY WORDS: Developmental dysplasia of the hip; Dega osteotomy; Surgical management; Functional outcomes; Pediatric orthopedics.

Cite as: Ali A, Khan M, Hayat S, Khan RE, Ali J, Khan Z, Haroon H. Clinical outcomes and surgical management of developmental dysplasia of the hip (DDH): a single-center experience with Dega osteotomy. Gomal J Med Sci 2026 Jan-Mar;24(1):35-41. https://doi.org/1046903/gjms/24.1.2149

INTRODUCTION

Developmental Dysplasia of the Hip (DDH) represents a spectrum of anatomical abnormalities affecting the developing hip joint, ranging from mild acetabular dysplasia to complete dislocation.[1] This condition remains one of the most challenging pediatric orthopedic disorders, with significant implications for long-term hip function and mobility if left untreated or inadequately managed.[2] The global prevalence of DDH varies significantly across different populations and geographical regions, with reported rates ranging from 1.6 to 28.5 per 1,000 live births.[3] Various factors influence the development of DDH, including genetic predisposition, female gender, firstborn status, and breech presentation.[4] Early diagnosis and appropriate intervention are crucial for optimal outcomes, as delayed treatment can lead to complications including premature osteoarthritis, gait abnormalities, and chronic pain.[5]

The management of DDH has evolved considerably over the past decades, with treatment strategies tailored to the patient's age at presentation and the severity of the condition.[6] While early detection

Corresponding Author:

Dr. Mudir Khan
Assistant Professor
Department of Pediatric Orthopedics
Khyber Teaching Hospital (KTH)
Peshawar, Pakistan..
E-mail: mudir_007@yahoo.com

Date Submitted: 23-08-2025
Date Revised: 19-02-2026
Date Accepted: 05-03-2026

and conservative management with Pavlik harness remain the gold standard for infants, surgical intervention becomes necessary for cases diagnosed later or those failing conservative treatment.[7] Among the various surgical techniques, the Dega osteotomy has emerged as a valuable procedure for acetabular remodeling in DDH.[8]

The Dega osteotomy, first described by Wladyslaw Dega in 1964, is an incomplete transiliac osteotomy that allows for three-dimensional correction of acetabular dysplasia.[9] This technique is particularly effective in addressing the complex anatomical abnormalities associated with DDH, including acetabular deficiency and femoral head coverage.[10] The procedure's versatility in achieving both anterior and lateral coverage while maintaining posterior stability has made it an attractive option for treating DDH in various age groups.[11]

The present study aimed to evaluate the clinical outcomes and effectiveness of surgical approach, with particular emphasis on the Dega osteotomy technique. By analyzing our single-center experience, we seek to contribute to the existing literature on surgical management of DDH and provide insights into factors influencing treatment outcomes. Our analysis encompasses various aspects of patient care, including preoperative planning, surgical technique modifications, and postoperative management protocols.

METHODS AND MATERIALS

This retrospective cross-sectional study was conducted by our research team initiated a comprehensive single-center investigation focusing on pediatric patients who underwent Dega osteotomy for developmental dysplasia of the hip at our institution's Department of Pediatric Orthopedics Khyber Teaching Hospital Peshawer. This cross-sectional spans from January 2020 through December 2024, capturing a focused period of surgical interventions and follow-up care. The investigation took place at our specialized pediatric orthopedic unit, which serves as a primary referral center for complex pediatric hip disorders across our geographic region. Our facility maintains dedicated operating theaters equipped with specialized pediatric orthopedic instrumentation and staffed by experienced surgical teams. The postoperative care unit features child-focused recovery spaces and rehabilitation facilities, staffed by pediatric nurses and physiotherapists with extensive experience in post-surgical hip care.

We included 35 consecutive patients who met our study criteria. The cohort demonstrated the characteristic female predominance of DDH, comprising 23 female and 12 male patients. Notably, our series included 14 bilateral cases and 21 unilateral presentations, resulting in a total of 49 operated hips. The mean age at diagnosis of 1.5 years reflects the demographics of our referral population, where delayed presentation remains a significant challenge. We carefully documented associated factors such as birth history, family history, and previous treatment attempts to build a comprehensive understanding of each case's progression. Our surgical approach followed a carefully developed protocol refined through extensive clinical experience. Each procedure began with precise preoperative planning, including detailed radiographic analysis and three-dimensional consideration of the required correction. The Dega osteotomy was performed through a standard Smith-Peterson approach, with careful attention to soft tissue handling and preservation of the sciatic notch periosteum. Twenty patients underwent isolated Dega osteotomy, while fifteen required additional procedures based on intraoperative findings. These supplementary interventions included open reduction, femoral shortening, and capsular plication, tailored to address specific anatomical requirements. Capsulorrhaphy was performed in 30 cases to enhance joint stability, with the specific technique modified according to individual capsular laxity patterns.

We implemented a structured data collection protocol encompassing surgical details, and operative outcomes. We recorded demographic information, clinical presentation patterns, and detailed radiographic measurements using standardized forms. Surgical documentation included operative time, blood loss, technical modifications, and intraoperative findings. Our statistical methodology employed both descriptive and analytical approaches using SPSS version 26.0. We calculated means and standard deviations for continuous variables, while categorical data underwent frequency analysis. We established statistical significance at $p < 0.05$. We used the chi square test to find out the association between DDH and other parameters. This study adhered to stringent ethical guidelines, operating under formal approval from the Research Ethical Committee of Iqra National University [Ref: INU/AHA/031-20]. We obtained informed consent from parents or legal guardians for both the surgical procedures and study participation. The study design and implementation followed the principles outlined in the Declaration of Helsinki, with particular attention to the special considerations required for pediatric research.

RESULTS

A total of 35 patients with developmental dysplasia of the hip (DDH) were included. Females comprised 65.7% (n=23) and males 34.3% (n=12). The most frequent age group was 4–6 years (51.4%, n=18), followed by 7–10 years (31.4%, n=11) and 1–3 years (17.1%, n=6). Hip involvement was right-sided in 40% (n=14), left-sided in 20% (n=7), and bilateral

in 40% (n=14). A positive family history of DDH was present in 20% (n=7) (Table 1).

Most patients reported no pain/ignored pain (82.9%, n=29), while 17.1% (n=6) reported slight/occasional pain (Table 1). Functional outcome measures showed: no need for mobility support in 97.1% (n=34), no limp in 77.1% (n=27), unlimited walking distance in 85.7% (n=30), and normal stair climbing

Table 1. Demographic, clinical characteristics, and surgical management of DDH patients (N=35)

Variable	Details	Frequency (%)
Gender	Male	12 (34.3%)
Gender	Female	23 (65.7%)
Age Group	1–3 Years	6 (17.1%)
Age Group	4–6 Years	18 (51.4%)
Age Group	7–10 Years	11 (31.4%)
Educational Level	Not Started	23 (65.7%)
Educational Level	Play Group	1 (2.9%)
Educational Level	Nursery	4 (11.4%)
Educational Level	Prep	4 (11.4%)
Educational Level	1st Class	2 (5.7%)
Educational Level	3rd Class	1 (2.9%)
Hip Suffered from DDH	Left Hip	7 (20%)
Hip Suffered from DDH	Right Hip	14 (40%)
Hip Suffered from DDH	Both Right and Left Hip	14 (40%)
Any family history of DDH	Yes	7 (20%)
Any family history of DDH	No	28 (80%)
Type of Harness use	No harness used	6 (17.1%)
Type of Harness use	Spica cast	28 (80%)
Type of Harness use	Both, Pavlik harness	1 (2.9%)
Type of operation for DDH treatment	Open reduction	5 (14.3%)
Type of operation for DDH treatment	Open reduction + Dega osteotomy + femoral shortening	3 (8.6%)
Type of operation for DDH treatment	Dega (pelvic) osteotomy	22 (62.9%)
Type of operation for DDH treatment	Dega osteotomy + femoral shortening + femoral derotation	3 (8.6%)
Type of operation for DDH treatment	Open reduction + Adductor Tenotomy + ORIF	1 (2.9%)
Type of operation for DDH treatment	Bilateral arthrography with closed reduction	1 (2.9%)
Pain in hip	No pain, or ignores it	29 (82.9%)
Pain in hip	Slight pain or occasional pain	6 (17.1%)

without support in 88.6% (n=31) (Table 2).

The mean age at diagnosis was 1.84 ± 1.2 years (range 0.5–5). The mean number of doctor visits was 6.57 ± 6.32 (range 0–36). Mean weight was 14.66 ± 2.99 kg (range 9–29) (Table 3).

Statistical analysis demonstrated a significant association between hip involvement pattern and the number of surgical procedures performed ($p < 0.001$). Hip involvement was also significantly associated with the type of harness used ($p = 0.032$), the type of surgical procedure performed ($p = 0.016$), reported postoperative hip pain ($p = 0.042$), and walking distance limitation ($p = 0.041$). No statistically significant association was observed between hip involvement and gender ($p = 0.363$), age group ($p = 0.804$), family history of DDH ($p = 0.732$), need for walking support ($p = 0.462$), limp presence ($p = 0.750$), or stair-climbing ability ($p = 0.877$). The distribution of variables according to hip involvement and corresponding p-values are detailed in Table 4.

Table 2. Functional outcomes following DDH treatment (N=35)

Variable	Details	Frequency (%)
Type of support used	None	34 (97.1%)
Type of support used	Cane for long walks	1 (2.9%)
Limp Support	Slight	8 (22.9%)
Limp Support	None	27 (77.1%)
Distance for walking	Unlimited	30 (85.7%)
Distance for walking	Indoor	5 (14.3%)
Climbing stairs	Normally without any support (railing/cane etc.)	31 (88.6%)
Climbing stairs	Normally but needs some support	4 (11.4%)

Table 3. Descriptive statistics of key variables

Variable	Mean ± Std.	Minimum	Maximum
Age at the time of diagnosis of DDH (years)	1.84 ± 1.2	0.5	5
Number of visits to the doctor	6.57 ± 6.32	0	36
Weight (kg)	14.66 ± 2.99	9	29

Table 4. Association of clinical and demographic variables with hip involvement (counts) and p-values

Variable	Details	Left Hip	Right Hip	Both Hips	P-value
Gender	Male	4	4	4	0.363
Gender	Female	3	10	10	0.363
Age Group	1–3 Years	1	2	3	0.804
Age Group	4–6 Years	4	6	8	0.804
Age Group	7–10 Years	2	6	3	0.804
Number of Surgeries Done	1	7	12	0	0.000 *(<0.001)*
Number of Surgeries Done	2	0	2	12	0.000 *(<0.001)*
Number of Surgeries Done	3	0	0	2	0.000 *(<0.001)*
Any family history of DDH	Yes	1	2	4	0.732
Any family history of DDH	No	6	12	10	0.732
Type of harness used	No harness used	0	3	3	0.032
Type of harness used	Spica cast	7	11	10	0.032
Type of harness used	Both, Pavlik harness	0	0	1	0.032
Type of operation for DDH treatment	Open reduction	0	2	3	0.016
Type of operation for DDH treatment	Open reduction + Dega osteotomy + femoral shortening	0	2	1	0.016

Type of operation for DDH treatment	Dega (pelvic) osteotomy	7	10	5	0.016
Type of operation for DDH treatment	Dega osteotomy + femoral shortening + femoral derotation	0	0	3	0.016
Type of operation for DDH treatment	Open reduction + Adductor Tenotomy + ORIF	0	0	1	0.016
Type of operation for DDH treatment	Bilateral arthrography with closed reduction	0	0	1	0.016
Pain in hip	No pain, or ignores it	7	9	13	0.042
Pain in hip	Slight/occasional pain	0	5	1	0.042
Type of support used	None	7	13	14	0.462
Type of support used	Cane for long walks	0	1	0	0.462
Limp Support	Slight	1	4	3	0.750
Limp Support	None	6	9	12	0.750
Distance for walking	Unlimited	7	10	13	0.041
Distance for walking	Indoor	0	4	1	0.041
Climbing stairs	Normal without support	7	12	12	0.877
Climbing stairs	Normal but needs some support	0	2	2	0.877

DISCUSSION

This study provides a comprehensive analysis of the clinical outcomes and surgical management of developmental dysplasia of the hip (DDH) using Dega osteotomy, based on a single-center experience. The findings are consistent with the published studies, which demonstrated the importance of early diagnosis and intervention in improving outcomes for DDH patients. [12] The predominance of female patients in this cohort (65.7 percent) aligns with previous studies, such as James et al. (2018), which reported a higher prevalence of DDH in females due to hormonal and anatomical factors. [13] The mean age at diagnosis in this study (1.84 years) is slightly higher than the average, which emphasize the critical window for diagnosis within the first year of life [14]. A study by Lv et al. reported that pediatrics found that early diagnosis within the first six months significantly reduces the need for surgical intervention. The delayed diagnosis observed in this cohort may be attributed to limited access to healthcare or lack of awareness, as noted in similar studies from developing regions. [15]

The surgical management of DDH in this cohort was dominated by Dega osteotomy, performed in 62.9 percent of cases. [16] This is consistent with findings Shen et al. which have highlighted the effectiveness of Dega osteotomy in achieving stable hip reduction and improving functional outcomes. [17] A study by Liu et al. demonstrated that Dega osteotomy has a success rate of over 85 percent in restoring hip stability in children aged 2-6 years. [18] The significant association between the number of surgeries and hip involvement ($p = 0.000$) underscores the complexity of managing bilateral cases. [18] Non-surgical interventions, such as the use of spica casting, were also prominent in this study, aligning with recommendations by Tisherman et al. [19] For instance, a study by Brown et al. (2016) in Wiley Clinical Orthopedics found that spica casting is effective in early-stage DDH management, [19] particularly in children under 18 months. [20] However, the limited use of Pavlik harnesses in this cohort (2.9 percent) contrasts with findings from developed countries, where Pavlik harnesses are more commonly employed as the first line of treatment. [21] Functional outcomes in this study were largely positive, with 85.7 percent of patients achieving unlimited walking distance and 88.6 percent climbing stairs without support. [22] These results are comparable to those reported by Kim et al. which document similar improvements in mobility and independence following surgical intervention. [22] A study by van Stralen et al. found that over 90 percent of patients who underwent Dega osteotomy regained full mobility within two years post-surgery [23]. The low incidence of postoperative pain (17.1 percent) further supports the efficacy of the surgical techniques employed. [24]

Despite these positive outcomes, the study has certain limitations, including its single-center design and relatively small sample size, which may limit the generalizability of the findings. Future research should focus on multicenter studies with larger cohorts to validate these results and explore long-term out-

comes. Additionally, the role of family history in DDH etiology warrants further investigation, as highlighted in recent BMC and Elsevier publications. A study by Kiani et al. found a strong genetic predisposition in families with a history of DDH, suggesting the need for targeted screening programs. [25]

CONCLUSION

This study highlights the critical role of early diagnosis and tailored surgical interventions, such as Dega osteotomy, in managing developmental dysplasia of the hip (DDH). The findings emphasize the importance of individualized treatment strategies to optimize functional outcomes and improve the quality of life for pediatric patients. Future research should focus on multicenter studies with larger cohorts to validate these findings and explore long-term outcomes.

Ethics approval and consent to participate

This study was approved by the Institutional Review Board (IRB) of via notification no-08/0/DME/KMC, dated 15/08/2025. Written informed consent was obtained from all participants or their legal guardians prior to inclusion in the study.

REFERENCES

1. Bakarman K, Alsiddiky AM, Zamzam M, Alzain KO, Alhuzaimi FS, Rafiq Z. Developmental dysplasia of the hip (DDH): etiology, diagnosis, and management. Cureus. 2023;15(8):e43207. https://doi.org/10.7759/cureus.43207
2. Guarniero R. Dysplasia of hip development: update. Rev Bras Ortop (Engl Ed). 2010;45(2):116–21. https://doi.org/10.1016/S2255-4971(15)30279-2
3. Pandey RA, Johari AN. Screening of newborns and infants for developmental dysplasia of the hip: a systematic review. Indian J Orthop. 2021;55(6):1388–401. https://doi.org/10.1007/s43465-021-00409-2
4. Alrashdi N, Alotaibi M, Alharthi M, Kashoo F, Alanazi S, Alanazi A, et al. Incidence, prevalence, risk factors, and clinical treatment for children with developmental dysplasia of the hip in Saudi Arabia: a systematic review. J Epidemiol Glob Health. 2024;14(3):549–60. https://doi.org/10.1007/s44197-024-00217-5
5. Laskaratou ED, Eleftheriades A, Sperelakis I, Trygonis N, Panagopoulos P, Tosounidis TH, et al. Epidemiology and screening of developmental dysplasia of the hip in Europe: a scoping review. Reports. 2024;7(1). https://doi.org/10.3390/reports7010010
6. Jaleca PECMR, Liggio DF, Arora S, Lam S, Schaeffer E, Grangeiro PM. Screening, diagnosis, treatment and outcomes of developmental dysplasia of the hip in Brazilian population: a scoping review. BMJ Open. 2025;15(2):e094660.
7. Giorgi V, Apostolo G, Bertelè L. Treatment of developmental hip dysplasia with manual therapy following Pavlik harness failure: a case report with long-term follow-up. J Man Manip Ther. 2024;32(3):352–61.
8. Bakti K, Lankinen V, Helminen M, Välipakka J, Laivuori H, Hyvärinen A. Clinical and sonographic improvement of developmental dysplasia of the hip: analysis of 948 patients. J Orthop Surg Res. 2022;17(1):538. https://doi.org/10.1080/10669817.2024.2349334
9. Swarup I, Penny C, Dodwell E. Developmental dysplasia of the hip: an update on diagnosis and management from birth to 6 months. Curr Opin Pediatr. 2017;30:1. https://doi.org/10.1097/MOP.0000000000000574
10. Grudziak J, Ward W. Dega osteotomy for the treatment of congenital dysplasia of the hip. J Bone Joint Surg Am. 2001;83-A(6):845–54.
11. Badrinath R, Jeffords ME, Bomar JD, Ahmed SI, Pennock AT, Upasani VV. 3D characterization of acetabular deficiency in children with developmental dysplasia of the hip. Indian J Orthop. 2021;55(6):1576–82. https://doi.org/10.1007/s43465-021-00458-7
12. Patel AH, Kreuzer SW, Sherman WF. Bilateral total hip arthroplasty in the setting of developmental dysplasia of the hip and extreme hip flexion requirements due to phocomelia. Arthroplasty Today. 2021;8:262–7.e1. https://doi.org/10.1016/j.artd.2021.01.005
13. Çiçekli Ö, Doğan M. Evaluation of surgical outcome in advanced age patients with developmental hip dysplasia. Int J Surg. 2018;52:44–9. https://doi.org/10.1016/j.ijsu.2018.02.020
14. Tao Z, Wang J, Li Y, Zhou Y, Yan X, Yang J, et al. Prevalence of developmental dysplasia of the hip (DDH) in infants: a systematic review and meta-analysis. BMJ Paediatr Open. 2023;7(1). https://doi.org/10.1136/bmjpo-2023-002080
15. Goiano EO, Akkari M, Pupin JP, Santili C. The epidemiology of developmental dysplasia of the hip in males. Acta Ortop Bras. 2020;28(1):26–30. https://doi.org/10.1590/1413-785220202801215936
16. Shaw BA, Segal LS. Evaluation and referral for developmental dysplasia of the hip in infants. Pediatrics. 2016;138(6). https://doi.org/10.1542/peds.2016-3107
17. Agostiniani R, Atti G, Bonforte S, Casini C, Cirillo M, De Pellegrin M, et al. Recommendations for early diagnosis of developmental dysplasia of the hip (DDH): working group intersociety consensus document. Ital J Pediatr. 2020;46(1):150. https://doi.org/10.1186/s13052-020-00908-2
18. Lv X, Yu S, Zhang T, Yang X, Xu Y, Li T. The outcome of early screening and treatment of developmental dysplasia of the hip in infants and toddlers in the Northern Guizhou region. Medicine (Baltimore). 2024;103(11):e37540. https://doi.org/10.1097/MD.0000000000037540
19. Zein A, Khalifa A, Elsherif M, Elbarbary H, Badaway M. Are the outcomes of single-stage

open reduction and Dega osteotomy the same when treating DDH in patients younger than 8 years old? A prospective cohort study. J Orthop Traumatol. 2023. https://doi.org/10.1186/s10195-023-00725-3

20. Shen SP, Kuo CC, Cheng HW, Tsai ML, Yang CY, Lin CL, et al. Breaking barriers: a pediatrician's perspective on enhancing early diagnosis of developmental dysplasia of the hip. J Formos Med Assoc. 2024. https://doi.org/10.1016/j.jfma.2024.07.008
21. Liu Y, Yang Y, Ding S. Application of 3D navigation for osteotomy of DDH in children: a systematic review and meta-analysis. Front Pediatr. 2022;10. https://doi.org/10.3389/fped.2022.1021981
22. Tisherman RT, Hoellwarth JS, Mendelson SA. Systematic review of spica casting for the treatment of paediatric diaphyseal femur fractures. J Child Orthop. 2018;12(2):136–44. https://doi.org/10.1302/1863-2548.12.170201
23. Khan L, Abdullah M, Ullah U, Haider Z, Roghani AS, Hassan RE, et al. The efficacy of thumb spica casting with or without corticosteroid injection for De Quervain's tenosynovitis. Cureus. 2024;16(7):e65408. https://doi.org/10.7759/cureus.65408
24. Ömeroglu H. Treatment of developmental dysplasia of the hip with the Pavlik harness in children under six months of age: indications, results and failures. J Child Orthop. 2018;12(4):308–16. https://doi.org/10.1302/1863-2548.12.180055
25. Novais E, Kestel L, Carry P, Meyers M. Higher Pavlik harness treatment failure is seen in Graf type IV Ortolani-positive hips in males. Clin Orthop Relat Res. 2016;474. https://doi.org/10.1007/s11999-016-4776-5

CONFLICT OF INTEREST
Authors declare no conflict of interest.
GRANT SUPPORT AND FINANCIAL DISCLOSURE
None declared.

AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	AA, MK
Acquisition, Analysis or Interpretation of Data:	AA, MK, SH, REH, JA
Manuscript Writing & Approval:	AA, MK, SH, REH, ZK, HH

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.