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A Review of "Capture rate" Between Physicians and Care-giver Suspicion Leading to Diagnoses of Late-presenting DDH: A Single Centre Perspective

Atul Bhaskar[1,2] FRCS(Tr & Orth), Purva Kansara[1] MS(Ortho)

Abstract

Background: The manifestations of DDH (Developmental Dysplasia of Hip) from newborn to walking age can go undetected due to several factors in the developing world. Lack of screening, reduced awareness amongst primary care physicians, socio-economic factors of family and access to healthcare facility. In many children the initial diagnosis is established only after an alert caregiver of physician notices suspicious asymmetry in gait pattern or limp.

The purpose of this review to compare the "capture" rate between physicians and caregivers suspicion that lead to the initial diagnosis of DDH and suggest strategies to enhance early detection of DDH.

Patient and Methods: A retrospective observational study was conducted between January 2002 and December 2018 at a single surgeon specialty centre in Mumbai, India. All children with a diagnosis of idiopathic DDH were included. Syndromic and teratologic hips were excluded. The data recorded from the charts included the following: birth history, mode and presentation of delivery, breech or normal, first born or later, age at initial presentation, demographic data, and whether hailing from urban or semi-urban and rural areas, and initial awareness by physician or caregiver. Any associated anomalies, and the side of involvement and surgical intervention was also recorded.

Results: The median age of diagnosis of DDH in the study was 22 months (one week-10 years) but in bilateral DDH it was 32 months ($p<.0001$). Physicians diagnosed DDH primarily in 37 children (28%) and 95 children (70.45%) were brought to the attention by caregivers especially in semi-urban and rural areas ($p<0.001$). Eighty-five children (64.39%) were diagnosed in the walking ages between 12 months - 48 months. Ninety-eight children (74.24%) in the entire study required surgical intervention mainly due to the late diagnosis made after infancy.

Conclusion: Delay in diagnosis of idiopathic DDH has significant implications both for surgeons, caregivers, and health care service providers. Any suspicious gait or limp in a child at walking age should alert investigation to rule out DDH.

Keywords: DDH; CAREGIVER; LIMP.

Dr. Atul Bhaskar

Address of Correspondence
Dr. Atul Bhaskar,
Hon.Paediatric Orthopaedic Surgeon,
Bombay Hospital Institute of Medical Sciences, Mumbai, Maharashtra, India.
E-mail: arb_25@yahoo.com

[1]Children Orthopaedic Surgical Services, MHADA complex, Oshiwara, Mumbai, India.
[2]Department of Orthopaedics, Bombay Hospital Institute of Medical Sciences, Mumbai, Maharashtra, India.

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Introduction

Developmental dysplasia of the hip (DDH) is the second most common congenital lower limb anomaly. Unlike clubfoot where the physical deformity is obvious, diagnosis of DDH requires extra vigilance. Thus, it is plausible that DDH often goes undetected [1,2]. The incidence of DDH in India is reported to be between 1 and 9 per 1000 live births [3-5].

Most developed countries have a neonatal screening program for early detection of DDH [6,7,8]. This may include universal screening of all new-borns as in Germany and the Scandinavian countries or selective screening as in the U.K. [9-11]. Risk factors used for selective screening vary between countries, and in the absence of universal guidelines, late presentation of DDH is not uncommon [12,13,14]. Morin et al reported a decrease in the quality and consistency over time of a French nation-wide DDH screening programme [15]. In the absence of a mandated screening program or structured referral pattern, there is considerable variability in the spectrum of DDH presentations in the Asian subcontinent [16-18]. There are several causative factors for delay in diagnosis: social, demographic, access to medical care and disparities in healthcare across regions [17,19].

Delayed detection due to a limp at walking age initiates the first radiographic assessment thus confirming the diagnosis of DDH [5, 15-20]. Usually it is the care-giver or parents that are first alerted to an abnormal or asymmetric gait [15].

The challenges involved in DDH surgery are more complex in older children than in the neonatal period or before walking age; hence the need for early diagnosis [12-14,16,17].

One previous study has reported the alertness of care-givers to detect DDH which the physicians have overlooked despite the consistent features present in a missed case [15]. Our aim is to report the first Indian experience in comparing the detection rate between physicians and caregivers that subsequently lead to diagnosis of DDH. We also propose suggestions to improve early detection and initiate timely referral.

Materials and Methods

A chart review was undertaken of all children with a diagnosis of DDH treated between 2002-2018 at a speciality clinic. Data from 2002-2015 was collected retrospectively and was prospective from 2016-2018. Teratologic, syndromic or neuromuscular cases and incomplete charts were excluded.

Data retrieved from the charts included: age at diagnosis, type of delivery (normal or Caesarean), breech presentation, first born or later, initial awareness by caregiver or physician, side of involvement, whether hailing from rural, semi-urban or urban setting, and treatment instituted. Any associated features such as metatarsus adducts, torticollis, calcaneovalgus foot, clubfoot and presence of any other physical anomaly were recorded. Classical Barlow and Ortolani tests were recorded in children during the first three months of presentation [21, 22].

Ultrasound images were available for the 10 neonatal cases and the remaining children had Pelvis with both hips (PBH) radiographs. The severity of DDH was graded according to the Tonnis classification [23].

Statistical analysis

Data were analysed using SPSS V15.0 (Statistical Package for Social Sciences, Version 15.0) package. Data were given as Mean ± SD for continuous data and Number and Percentage for categorical data. Student's unpaired t test was applied to compare means between 2 groups. Fisher Exact Probability tests were applied to compare percentages for categorical data between 2 groups. All statistical tests were two tailed. Alpha (α) Level of Significance was taken as $P \leq 0.05$.

Results

A total of 132 children (143 hips) from a database of 184 cases fulfilled the inclusion criteria and had a complete set of records for review. The median age at presentation was 22 months (one week-10 years) and the interquartile range was 17.7 months (Range: one week-10 years). The patient demographics are listed in Table 1.

All deliveries were conducted in the hospital setting. Associated anomalies seen in children are listed in Table 2. Of the 143 hips in the study, 110 hips were Tonnis Grade 4, twenty-eight hips Grade 3 and five hips Grade 2. The range of hip motion was recorded only for about 50% of cases, especially in non-walking children.

The initial diagnosis was made by the physician in 39 children (29.5 %) and in the remaining 93 (70.45%) children it was the caregiver that noticed asymmetry in leg or suspicious walking pattern. There was no significant

Table 1: Demographics of children in the study

	N = 132
Sex	
Boys	46
Girls	86
Side of involvement	
Left	85
Right	36
Left	11
Bilateral	
Mode of birth	
Normal	103
Caesarean	29
Birth sequence	
First born	121
Later born	11
Breech presentation	
Normal delivery	20
Caesarean Section	6

Table 2: DDH and associated anomalies

Anomalies	Frequency	% of Total (N = 132)
Clubfoot	4	3.00%
Metatarsus adductus	7	5.30%
Torticollis	2	1.50%
Calcaneovalgus foot	8	6.00%
TOTAL	21	

Table 3: Detection of DDH in the urban and rural settings

	PHYSICIAN	CAREGIVER	TOTAL
URBAN	26 (66.7%)	11 (11.8%)	37 (28.0 %)
RURAL SEMI-URBAN	13 (33.3%)	82 (88.2%)	95 (72.0%)
TOTAL	39 (100.0%)	93 (100.0%)	132

Table 4: Comparison between unilateral and bilateral DDH

	Unilateral DDH (n=121)	Bilateral DDH (n=11)	P value
Age (months)	23.08 ± 19.22	37.16 ± 25.96	P=0.023
Sex	Girls = 78 (65%)	Girls = 8 (73%)	P=0.75
	Boys = 43 (35%)	Boys = 3 (27%)	
Detected by	Physician = 37 (30%)	Physician = 2 (18%)	P=0.55
	Care giver = 84 (70%)	Care giver= 9 (82%)	

Data: Mean ± SD or Number (%)

difference in physician and care-giver distribution in detecting unilateral and bilateral DDH. A significant difference in the detection rate by care-givers/parents was noted in the rural and semi-urban setting (Table 3). Thus, it was the abnormal finding of leg or gait asymmetry that urged the care-givers to seek opinion from the physician. All walking children with unilateral DDH presented with a painless limp, and with the foot occasionally in external rotation. In bilateral DDH, the characteristic waddling gait suggestive of dynamic Trendelenburg sign was evident and, in children more than 3 years, the lumbar lordosis was exaggerated.

In nine children with bilateral DDH (81% of bilateral cases), the caregiver alerted the physician about abnormal and waddling gait. The median age of presentation in bilateral cases was 32 months (range: 2 months-96 months). In unilateral cases, the median mean age of presentation was 21 months (range: one week-120 months). The IQR for unilateral DDH was 16 months (range 12 months-28 months). There was no significant difference in gender distribution between unilateral and bilateral DDH (Table 4). 40% of children were diagnosed at walking age between 12 and 24 months.

In two cases of bilateral DDH (19%), the physician detected the pathology subsequently confirmed by radiographs. One child had severe restriction of abduction and the other had excessive lumbar lordosis.

Of the 132 children, one hundred and twenty-one children (91%) were first born.

There was positive family history on the maternal side in two cases. Ninety-five children hailed from rural and semi-urban regions (71.96 %) and 37 children (28.04 %) were born in an urban area.

Neonatal DDH was diagnosed in 10 children before four weeks. Two had hip instability with a positive Barlow test and eight had frank dislocation as confirmed by Ortolani test. All eight hips were treated with Pavlik harness. One had bilateral DDH that also responded to Pavlik harness treatment. Twenty-four children (25 hips) were treated with arthrogram, closed reduction (CR), and hip spica. One child with bilateral DDH was also treated similarly. The mean age of CR group was 4.7 months (range 3-9 months).

Ninety-eight children (106 hips) underwent surgical intervention: open reduction (OR) in 38 children (42 hips), open reduction with femoral varus osteotomy (FVO) in 32 children, open reduction with combined femoral and

pelvic osteotomy (PO) in 20 children, and open reduction with pelvic osteotomy (OR+PO) in eight children.

Discussion

The demographics of DDH is highly variable in the Asian subcontinent compared to the developed world where robust neonatal screening programs for DDH have led to negligible rates of missed or late-presenting DDH [24,25]. However, ultrasound based DDH screening programmes are not universally successful in reducing the incidence of late-presenting DDH as shown by a large population-based survey in England. In this study of 754 patients with late presenting DDH, selective screening and emphasis on the Newborn and Infantile Physical Examination (NIPE) guidelines failed to reduce the incidence of late-diagnosed DDH. 536 children (71%) were diagnosed at walking ages between one and two years. The authors stated that DDH remains a "still uncontrolled disability" and recommended universal screening [26]. Conversely, routine ultrasound screening of neonatal hips may have also led to overzealous treatment in clinically stable hips with sonographic hip dysplasia [27].

The most common presentation of late or missed DDH is a painless limp [5,15,16,17]. In a prospective study by the French Paediatric Orthopaedic Group (SOFOP) Morin et al reported 66 children that presented after age one year. The authors state "that the alert was given by parent or child-minder worried about a limp in 85.9% of the cases and only in 14.1% the DDH was picked by the physicians" [15].

Neonates born in urban and semi-urban locations are typically examined by paediatricians at birth. Only a few of these paediatricians or primary care physicians specifically look for hip dysplasia, depending on their training and experience [3,5,16,17,28,29]. This fact is substantiated by our report in that only a small fraction of dislocations was referred in the first 3 months of life.

Rebello and Joseph reported 44 cases of late presenting DDH, of which 19 cases (47%) were diagnosed at walking age [5]. Eighteen children required soft tissue or bony surgery. In our study, 85 out of 132 children (65%) were diagnosed only after the child had started walking.

Our findings substantiate the need for a formal DDH screening programme in India to reduce the incidence of late-presenting DDH. We propose that children should undergo a physical examination at every immunisation visit to the paediatrician. In the neonatal period, hip instability tests are valuable in detecting DDH. In the older child, a rapid examination consisting of hip abduction, Galeazzi test and observation of the gait will lead to earlier and better detection of DDH. Primary care physicians, paediatricians and orthopaedic surgeons can be educated to perform these basic maneuverers. When carers report an abnormal gait or other concerns relating to the hip (such as difficulty in changing diapers), the physician should conduct a careful examination of the hip and order an ultrasound or plain x-ray of the hip where indicated.

There are several limitations in the study. It is a retrospective case-note review. Patients from different geographical areas were classified and compared but it is not a population-based study. Our findings have to be corroborated by a larger multi-centre, population-based study that includes children from rural and urban locations.

Conclusion

Any painless limp, leg asymmetry, or suspicious finding reported by care givers around walking age should alert the physician to rule out DDH. We hope this study will stimulate further research and strategies for the prevention of late-presenting DDH.

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