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Research Article

Risk Factors Assessment of Patients Diagnosed with Developmental Dysplasia of the Hip: Review of 574 Patients

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Keywords

- DDH
- Risk factors
- Family history
- Hip examination

Abstract

Background: Early detection of developmental dysplasia of the hip (DDH) will provide an early conservative management and reduce the chance of surgical intervention. Many risk factors of DDH have been identified (family history, breech presentation, being first child, and oligohydramnious).The aim of the study is to assess the risk factors in patients diagnosed with DDH.

Methods: A retrospective study on DDH patients from January 2007 to December 2013, in two major hospitals. Data was collected from the charts and X-rays were reviewed by pediatric orthopedic staffs.

Results: Out of 574 DDH patients (832 hips) identified in the study, 515 (89.7%) presented to the clinic at age of more than 3 months. The majority of the affected patients were female (479 [83.5%]). Only 253 patients (44.1%) had an identifiable risk factor while 50 patients (19.8%) had more than one risk factor. Among all study subjects, only 5 patients (0.9%) had oligohydramnious during their pregnancy, 54 (9.4%) presented with a history of breech presentation, 86 (15%) were first child to the family, and 165(28.8%) had a positive family history for DDH.

Conclusion: Family history was found to be the most prevalent risk factor of DDH while oligohydramnious was the least. No risk factors were identified in most of the DDH patients, thus we recommend a carful hip examination by pediatrician during the regular follow up. Since most patients were diagnosed late after the age of 3 months, we recommend a national screening program for every newborn in the nursery and pediatricians should be carefully examine and follow them up in the well-baby clinic with vaccinations.

ABBREVIATIONS

DDH: Developmental Dysplasia of the Hip; **AVN**: Avascular Necrosis.

INTRODUCTION

Developmental dysplasia of the hip (DDH) is a spectrum of hip abnormality. The abnormality includes the osseous structures, such as the acetabulum and the proximal femur, as well as the labrum, capsule, and other soft tissues [1]. DDH may occur at any time, from conception to skeletal maturity [1]. The spectrum of DDH includes acetabular dysplasia (shallow or underdeveloped acetabulum with concentric hip joint), sub luxation (incomplete contact between the articular surfaces of the femoral head and acetabulum), dislocation (complete loss of contact between the articular surface of the femoral head and acetabulum), and teratologic hip (antenatal dislocation of the hip, which is associated with neuromuscular conditions and genetic disorders like arthrogryposis, myelo meningocele, and Larsen's syndrome) [2-5]. Incidence varies according to race and geographic location, the incidence is estimated to be < 0.1 in Africans living in Africa and 76.1 in Native Americans per 1000 births [6]. For instance, the incidence of DDH per 1000 births is 1.1 in North America, 3.6 in the United Kingdom and 6.8 in Australia [6].

In case control and observational studies, female gender, breech positioning at delivery, family history of DDH, and increased birth weight (> 4000 g) have been most consistently shown to have an association with the diagnosis of DDH, though most of the infants diagnosed with DDH have no identifiable risk factors [7]. Knowing the common risk factors of DDH will help physicians to have a higher index of suspicion for diagnosing DDH. Also with the physical examination by using Ortolani and Barlow maneuvers and use of the imaging modalities (ultrasonography)

for confirming the diagnosis, it might help in early diagnosis of DDH [8]. DDH patients have a high risk for lifelong complications including leg length discrepancy, premature osteoarthritis, and hip and/or lower back pain [9]. The aim of this study is to assess how many risk factors present in idiopathic DDH patients in a population where no screening for DDH is performed.

MATERIALS AND METHODS

We retrospectively reviewed 574 DDH patients from January 2007 to December 2013 at 2 major hospitals. There is no available screening program dedicated for DDH, so all data were collected from patient's file, and all X-rays were reviewed by pediatric orthopedic staffs. DDH was defined and classified according to International Hip Dysplasia Institute (IHDI) [10], which uses the mid-point of the proximal femoral metaphysis as reference landmarks, therefore can be used to children of all age groups. Most common studied risk factors were included (family history, breech presentation, oligohydramnious and being first child). Although swaddling is relatively one of the common practices in our population, and considered as one of the known risk factors in DDH, it was not included in this study due to incomplete documentation in that regards. All idiopathic DDH were included in the study while neuromuscular and teratologic patients were excluded. Data was collected and statistically analyzed using SPSS version 21. Frequencies and percentages were used for categorical variables.

RESULTS

Of the 574 patients with DDH 479 (83.5%) were female and 95 (16.6%) were male, giving a ratio of 5:1. The number of patients diagnosed at the age of three months and below was 59 (%10.3), while 515 patients (%89.8) were diagnosed at age more than3 months, with the average age of presentation being16.3 months (range: 1 week - 2.4 year). The number of patients with identified risk factors was 253 (44.1%); 203 (35.4%) had one risk factor, 43 (7.5%) had two risk factors and 7 (1.2%) had three risk factors. No risk factors were identified in321 (56%) patients (Table 1).

Family history was identified to be a risk factor in 165 patients (28.8%). The number of patients who were first child was 86 (15%), while history of breech presentation was identified in 54 (9.4 %). Only 5 patients (0.9%) had history of oligohydramnious during their pregnancy.

Unilateral DDH was identified in 316 patients (55%); 146 right sides DDH (25.4%) and 170 left side DHH (29.6%). The number of patients who have bilateral DDH was 258 (45%).

DISCUSSION

Late DDH presentation, after walking age, attributes to several complications like increase in the incidence of avascular necrosis (AVN), recurrent subluxation, and leg length discrepancy. Late diagnosis of DDH will lead to more surgical interventions and subsequently increase the risk of complications. (Figure1,2). We believe these can be prevented by early detection if careful examination of infants from birth and throughout the first year of life was performed in the well-baby clinic. Provocative testing includes the Ortolaniand Barlow maneuvers, Galeazzi test, which is shorting of the femur with flexed hips and knees, asymmetry of the thigh or gluteal folds, and leg length discrepancy, are

Table 1: Risk factors frequencies in DDH patients.

Number of risk factor(s)	Risk factor(s)	Frequency (patients)	Total (percentage)	
None		**321 (55.9%)**	**55.9%**	
One risk factor	Family history	54 (9.4%)	203 (35.4%)	**253 (44.1%)**
	First born	86 (15%)		
	Breech presentation	54 (9.4%)		
	Oligohydramnious	5 (0.9%)		
Two risk factors	Breech, First born	7 (1.2%)	43 (7.5%)	
	Breech and Family history	14 (2.4%)		
	Oligohydramnious, First born	1 (0.2%)		
	Family history and First born	20 (3.5%)		
	Family history, Oligohydramnious	1 (0.2%)		
Three risk factors	Breech, First born, and Family history	6 (1%)	7 (1.2%)	
	Oligohydramnious, First born, Family history	1 (0.2%)		
TOTAL			**574 (100%)**	

DDH: Developmental Dysplasia of the Hip

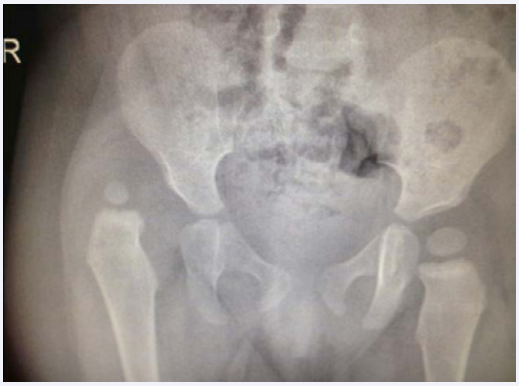

Figure 1a AP pelvic X-ray of 19 months old boy showed right DDH who diagnosed late after walking age.

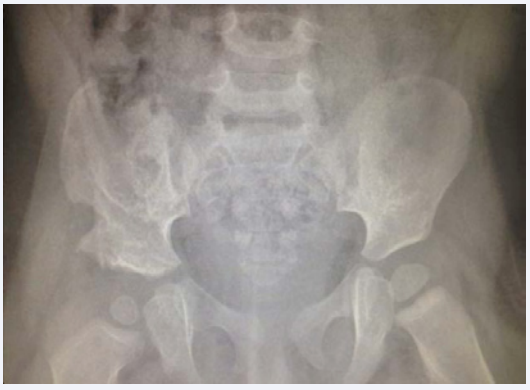

Figure 1b 6 months post operative X-ray (open reduction and pelvic osteotomy were preformed).

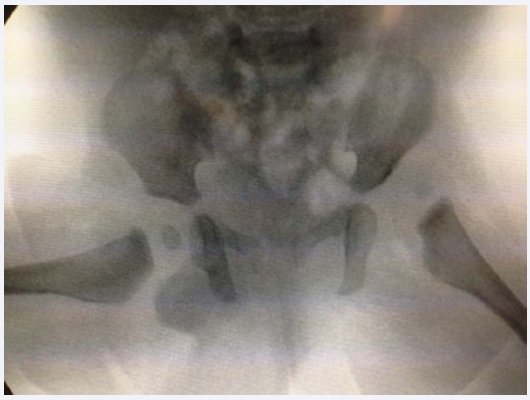

Figure 2a AP pelvic X-ray of 8 months old female showed left DDH who diagnosed late.

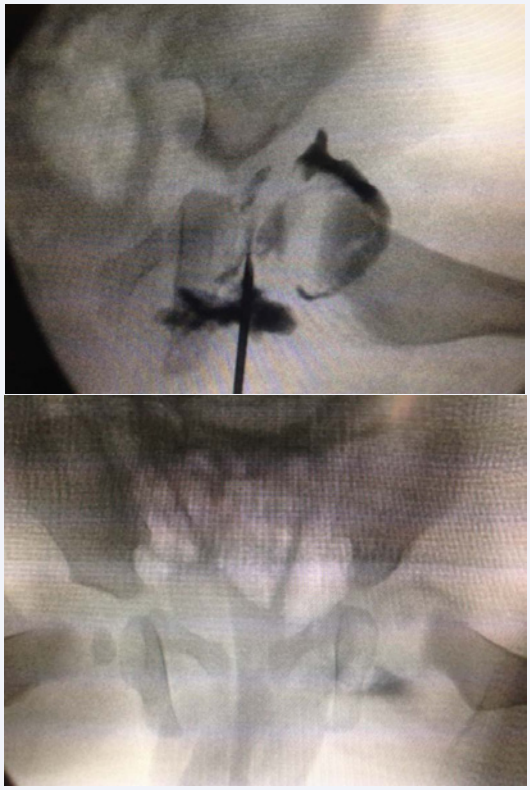

Figure 2b Left hip Arthrogram and closed reduction were performed under general anesthesia followed by hip spica.

important clues [11]. For instance, Findings observed using Ortolaniand Barlow tests differ according to different examiners [12]. Higher sensitivity was observed when experts conducted the examination [13]. Knowing the risk factors of DDH with appropriate physical examination and using proper imaging modality will help in the early detection of patients with DDH [7,8]. 89.7% of our patients were presented to orthopedic clinic and diagnosed at age more than 3 months, with an average age of 16.3 months (range: 1 week - 2.4 year) indicating late diagnosis. In contrast, Loder R and Shafer C [14] found that the average age at first orthopedic clinic visit in their institute was 1.6 months. Greene WB et al. [15], believed that patients with bilateral DDH tend to present later than those who have a unilateral DDH, while Mulpuri K et al. [16], found that patients who present lately tend to have more unilateral disease. Approximately half of our patients 298 (52%) who presented to the clinic at age more than 3 months found to have unilateral DDH.

Although increased incidence in girls was attributed to a transient increase in ligamentous laxity related to increased susceptibility of female infants to the maternal hormone relaxin [17].Vogel I et al. [18], refuse this hypothesis. Akman A et al. [19], found that being female increases the risk for DDH. Ortiz-Neira CL et al. [20], found that DDH is two to three times more common in female than in male infants. In this study479 (83.5%) of our patients were female, which was 5 times higher than the number of male patients.

Several studies found that Family history is associated with DDH [18,20-22]. Loder RT et al. [14], identified 14.2% of total patients had positive family history in a retrospective review study. The absolute risk of DDH in infants with a positive family history is estimated to be 4.4% in girls versus 0.9% in boys [1]. In a meta-analysis of risk factors for DDH that included four studies (> 14,000 patients), the relative risk for positive family history was 1.4 (95% CI 1.23-1.57) [20]. In this study, family history was found to be the most prevalent risk factor among others (28.8%).

Being first born is one of the reasons that limit fetal immobility. Primigravid uterus may create a tighter space for the fetus, limiting mobility [23,24]. Loder RT et al. [14], found that first-born children were in 48.3 % of their study population. Ortiz-Neira C, et al. [20], found that the relative risk for 208 first born infants was 1.4 (95% CI 1.12 to 1.86) in a meta-analysis of risk factors for DDH that included five studies (114,917 study subjects).In this study, being a first child was found to be the second most prevalent risk factor (15%).

Breech presentation is the greatest risk factor for DDH among conditions that limit fetal mobility; the absolute risk of DDH is estimated to be 12% in breech girls and 2.6% in breech boys [1]. In a meta-analysis study that included 15 studies (> 359,300 patients) [20], the relative risk for breech presentation was 3.8 (95% CI 2.25-6.24). In our study, we found that breech presentation was the third most prevalent risk factor (9.4%) followed family history (28.8%) and being a first baby (15%). Akman A et al. [19], concluded in their study that oligohydramnious is the most important risk for DDH while swaddling and being female increases the risk of the disease. Only 5 (0.9%) patients in our study had history of oligohydramnious during their pregnancy.

There are many limitations in this study. The swaddling which considered being known risk factors was not included due to lack of documentation. Family history is not specific to certain degree relatives and would have been more accurate if it was specified in the files. We needed more male patients in order to compare risk factors in respect to gender.

In the future there is a plan to conduct a screening program for DDH in selected hospitals in the same city and then implemented as a national program.

In conclusion, early diagnosis of DDH is important for the outcome. Since many DDH children do not have risk factors therefore screening should be offered to all newborn children and systematically during the follow up at well-baby clinic and the first years of life.

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