

RISK FACTORS AND EARLY DETECTION OF DEVELOPMENTAL DYSPLASIA OF HIP BETWEEN 0-6 MONTHS AGE OF CHILDREN

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Abstract

Introduction

A group of hip development problems affecting infants are known as developmental dysplasia of the hip (DDH). It is among the most prevalent hip conditions in young children. Many factors have been identified as risk factors or coexisting the DDH, including positive family history, joint laxity, breech birth, being the firstborn child, oligohydramnios, female gender, multiple pregnancies, ethnicity, and the presence of various orthopedic conditions in infants, such as torticollis and foot deformities. Our aim in conducting this retrospective analysis was to identify the prevalence of DDH and the most risk factors affected this pathology.

Methods

It is a retrospective study in which are involved 84 children between January 2021 to December 2023. Inclusion criteria: all children who need conservative treatment. Exclusion criteria: children who need surgical treatment and with dislocated hip. These data were collected from clinical charts and were processed with the statistical package SPSS version 20. Where categorical variables are expressed in frequency and percentage. Chi-squared is used and the p value ≤ 0.05 is considered significant.

Results

In our survey are involved 85 patients with 121 cases of DDH. Our research revealed a number of risk variables for DDH. The highest rate of diagnosis is age group 0-2 months with 56.2%. Females are more affected than males ($p < 0.0001$). 60% of cases were bilateral, 25 % left and 15% right side. 27.3% of cases are diagnosed by ultrasonography and only 33.1% are treated with Pavlik harness with a high percentage of success.

Conclusion

DDH is an important medical issue for infants that can cause discomfort and long-term mobility issues. Preventing long-term problems from DDH requires early detection and treatment, especially when diagnosed in the first month after birth.

Keywords: infant, developmental dysplasia of hip, diagnosis

1.Introduction

Developmental dysplasia of the hip (DDH) is a congenital anomaly that is represented by abnormally developed of acetabulum but also other anomalies too. This dysplasia is a pathology where the femoral head no longer maintains normal anatomical relationships with the acetabulum [1] but also is abnormal development of soft tissues forming the structure of the hip and dislocation of femoral head as well.

We will find the first descriptions of DDH from Hippocrates (400-300 BC) who indicated that it could be caused by compression in the mother's womb. Later, Paletta and Dupuytren around the 1832 described the dislocation of the hip as a congenital anomaly [2]. Realizing thus, that this child pathology has generated debate and interest in medical field since Hippocrates' day.

Over the years and even the development of science in the field of medicine, this pathology remains a

challenge because clinically the hip appears normal [3], but dysplastic changes are likely to occur [4,5]. Thus, the ultrasonographic classification introduced by Graf about the hip joint in the 1980s had and continues to have a positive impact on the diagnosis and screening of this pathology [6,7,8]. Although the precise prevalence of DDH is still unknown, several researchers have reported that it range about 3.17-4 per 1000 live births [9].

Many factors have been identified as risk factors or coexisting the DDH, including positive family history, joint laxity, breech birth, being the firstborn child, oligohydramnios, female gender, multiple pregnancies, ethnicity, and the presence of various orthopedic conditions in infants, such as torticollis and foot deformities [10,11]. So, early diagnosis enables efficient treatment with less complicated techniques that are readily available, palatable to the family, and have a favorable prognosis [12]. Also, early identification and intervention can prevent hip replacements as a result of chronic

hip dysplasia and arthritis, which can lead to symptoms like walking difficulties and pain in the hips, knees, and lower back [13]. While, depending on the patient's age of presentation based and the severity of dysplasia, treatment options may include surgical reduction and osteotomy, Pavlic harnessing, and other procedures.

The majority of researcher claim that a diagnosis of DDH given after the age of three months is regarded as delayed, leading to poorer results and a great requirement for surgical intervention [14]. In USA [15], Turkey [16], and also, according to current Irish legislation, newborns who show signs of an unusual clinical examination or positive risk indicators, like a first-degree family history or breech presentation, should have a screening ultrasound done [17].

Our aim in conducting this retrospective analysis was to identify the prevalence of DDH and the most risk factors affected this pathology.

2. Material & Methods

This study that aimed to investigate the prevalence of DDH is conducted at Service of Orthopedic -Traumatology, University Hospital, Tirana, Albania. It is a retrospective study in which are involved 84 children between January 2021 to December 2023. Inclusion criteria: all children who need conservative treatment.

Exclusion criteria: children who need surgical treatment and with dislocated hip. These data were collected from clinical charts and were processed with the statistical package SPSS version 20. Variables such as: age, gender, diagnosis method, type and duration treatment were analyzed through it. Also, some risk factors like breech presentation or family history are calculated too. Where categorical variables are expressed in frequency and percentage. Chi-squared is used and the p value ≤ 0.05 is considered significant.

3. Results

Our study which is conducted from January 2021 to December 2023 revealed a total of 85 children with 121 cases with developmental dysplasia of the hip (DDH) presented to the orthopedic service. The year 2023 has the highest frequency with 43 (35%) cases, while the lowest but not with any significant difference was 2022 (37,31%) (Tab.1). Most of the cases with dysplasia live in rural are 73 (60%) and 48 (40%) of them in urban are. According the age group, the most frequent age is 0-2 months with 68 (56.2%) cases, followed by the 2-4 months age group with 32 (26.4%) cases. While the age group 4-6 months appears in has fewer cases (21/17.4%) (Tab.2).

Table 1.

Distribution of DDH according of study years		
Year	Frequency of DDH	Percentage (%)
2021	41	34 %
2022	37	31 %
2023	43	35 %

Table 2.

Demographic data of cases with DDH		
	Categories	Frequency/ Percentage (%)
Living area	Urban	48 (40%)
	Rural	73 (60%)
Age group	0-2 months	68 (56.2%)
	2-4 months	32 (26.4%)
	4-6 months	21 (17.4%)

During the analysis of the data in our survey, we find that 72 (60%) cases out of 121 in total are affected on both sides and especially at 2021 with 32 (78%) cases. Moreover, we will find that the most affected side with 31(25%) out of 121 cases is the left hip which

has a frequency respectively: 6 (15%), 7 (19%), 18 (42%) for the years under taken in study. The right side is less affected, which marks the highest frequency in 2022 with 2(5%) cases and the highest in 2023 with 13(30%) out of 18 cases in total (Tab.3).

Table 3.

DDH distribution according the affected side			
Year	Right No / %	Left No / %	Bilateral No / %
2021	3(7%)	6 (15%)	32 (78%)
2022	2 (5%)	7 (19%)	28 (76%)
2023	13 (30%)	18 (42%)	12 (28%)
Total of 121 cases	18 (15%)	31(25%)	72 (60%)

Table 4 shows some risk factors affecting the developmental dysplasia of the hip. So, in our study are 69 (82 %) female compared with male. We see that there is a significant correlation between variables of

gender and diagnosis (chi-square test, $p < 0.0001$). Also, there is a strong correlation between presentation during delivery and first delivery with diagnosis (chi-square test, $p < 0.0001$).

Table 4.

Distribution of DDH according some risk factors			
Risk factors	Categories	(%)	P value
Sex	Female	69 (82 %)	< 0.0001
	Male	15 (18 %)	
Family history	Positive	4%	< 0.005
	Negative	96%	
Presentation during delivery	Vertex	78%	< 0.0001
	Breech	22%	
First delivery	Positive	61%	< 0.0001
	Negative	39%	

Suspicious for developmental dysplasia of hip in some of the cases presented in the study

are diagnosed by pediatrics from maternity because of Ortolani test positive and they have recommended to the parents a visit to the orthopedic service. But most of them are diagnosed by using ultrasonography according to the medical protocol.

In our study out of 121 cases with DDH, the age in weeks that prevails more when performing the first ultrasonography is 6 weeks with 33 cases. It is followed by almost the same number of cases at the ages of 8 and 12 weeks. Other data are described in the table below.

Table 5.

Distribution of age group in the first hip ultrasonography	
Ultrasonography in weeks	Frequency(%)
4	4(3.3)
6	33(27.3)
8	31 (26)
12	32(26.4)
16	21(17.3)

Another variable evaluated during this study is the treatment method. It turned out that in the series of cases included in the study, 40(33.1%) cases are treated with Pavlik harness, 79(65.2%) cases are follow-up without treatment and 2(1.7%) cases underwent operation. Clinically and sonographically, the 79 untreated newborns were closely monitored.

4. Discussion

Our study and others too [18] highlight that early diagnosis of developmental dysplasia of the hip reduces complications in the future. In this 3-years retrospective study, several risk factors for this pathology are highlighted like as: female sex, family history for DDH and breech presentation. Similar finding are presented in a 10-year retrospective study conducted by Bahar Kural et al. [19].

In our series we find that the age group with the highest frequency is 0-2 months with 68 (56.2%) cases. It means that parents are aware and caring, thus influencing the early diagnosis of this pathology. The earlier the diagnosis of DDH and initiation of brace treatment, the better the outcomes. A late diagnosis is associated with longer, more complex treatment [20].

As mentioned in a systematic review conducted by Maryam Ashoor et al., it shows that there are several devices to treat the DDH. He demonstrated that the von Rosen splint had the lowest rate of failure. Considering the growing popularity of Pavlik harness treatment, these results were unexpected. Von Rosen splint are twice as expensive as Pavlik harness, which may have contributed to their popularity [21]. While in a survey led by C. Alves et al. showed that 90% of POSNA (members of the Pediatric Orthopaedic Society of

North America) and 71% of EPOS (member of European Paediatric Orthopaedic Society) used Pavlik harness for DDH treatment [22]. In our country we also use more Pavlik harness, as our 40(33.1%) cases out of 121 developmental dysplasia of hip have been treated and which have resulted successfully. Bracing in early DDH is considered the gold standard treatment method with low complication rates [20]. While 79(65.2%) of our cases are followed without treatment. Researchers have showed that almost 96% of patients with mild instability at birth resolve spontaneously within the first six weeks of life [23].

Ellen de Oliveira Goiano et al. in her cross-sectional study that included 147 patients with 216 affected hips showed that the most affected gender are women. Individuals from diverse ethnic background and geographical regions exhibit notable variations in the incidence and frequency of DDH. The American Academy of Pediatrics reports that the total relative risk of DDH incidence in children is 19/1000 in females, 4.1/1000 in boys and 11.5/1000 in cases of live births and according to her statistics the ratio of gender is 1 boy for every 5.7 girls [24]. Since boys are less affected, it is believed that there is a hormonal cause or a less pronounced joint laxity in males [25]. Our findings are also almost in the same line, 1 boy for every 4.6 girls. So in our series out of 85 patients we have 69 (82 %) females and 15 (18 %) males.

Another important issue in this survey is the diagnosis time of this pathology. Huan Xiao et al. reported that ultrasound is a worldwide examination to diagnose the DDH among children under six months of age. Some countries like : Austria, Sweden, Germany, the Czech Republic, and Switzerland use the Graf technique as a

screening method and in some others countries, patients whose physical examination reveals risk indicators are sent to experts for additional diagnosis using US examinations [26]. Adelina Ionescu et al., in their retrospective single-center multifactorial study stated that there isn't standardized criteria on whether a hip ultrasound should be carried out only in selective cases having risk factors. No international consensus regarding DDH screening has been established. This study also shows different attitudes from different authors. Some researchers think US is not cost-effective and some others think differently [27]. However, in our country we use US to diagnose DDH but also clinical examination. Ultrasonography is the investigation of choice for DDH in the first six months of life. It is more beneficial to evaluate sub-types of the disorder when the clinical examination is inconclusive. Moreover, this is the only imaging mode that provides real-time 3D images of the hip joints of newborns. Other benefits include the avoidance of radiation, hip joint puncture, medium contrast, and sedation [28,29]. In our series, the highest frequency of using ultrasonography is in the 6th week after the birth of the baby, thus diagnosing at the right time this pathology. As a result of this early diagnosis, the success of the treatment is also considerable. Patients who needed treatment were treated with Pavlik harness. Complications related to the use of the Pavlik harness are rare when it is adequately used [30].

5. Conclusion

DDH is an important medical issue for infants that can cause discomfort and long-term mobility issues. Preventing long-term problems from DDH requires early detection and treatment, especially when diagnosed in the first month after birth. It would be good to create a registry with a special code for each of these patients, so that, during their lifetime we understand what kind of pathology they develop as a result of dysplasia, so that researchers can be more clear about it.

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