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Early detection and risk factors of congenital hip dislocation in Morocco

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Abstract. Congenital dislocation of the hip is a malformation of the lower limbs that could be complicated by a disabling physical handicap with long-term psychological and social repercussions if detected late. This study aims to describe the screening for congenital hip dislocation and to investigate the association between the occurrence of this anomaly and possible risk factors in Morocco. The study was based on the exploitation of the records of children treated at the trauma and orthopedics department of the Mohammed VI University Hospital in Marrakech, Morocco. It concerned 160 cases with a 5-year follow-up from January 2016 to March 2021. The results of the study showed that 56.7% of the affected children had a bilateral dislocation and 25.8% of the cases had a left-sided dislocation. The malformation occurred more frequently in females 69.2%. A familial disposition to the malformation was found in about 22% of the cases. The diagnosis was late (at walking age) in 61% of children following the onset of lameness with or without pain in 91% of children. In 41.87% of the hips, the reduction was surgical, with 28% failure dominated by acetabular dysplasia in 11%. The risk factors for congenital hip dislocation identified in our setting were dominated by sex, primiparity, consanguineous marriage, and the presence of a family history of dislocation. Communication of risk factors specific to our setting to healthcare personnel will allow them to guide the diagnosis and increase vigilance in the at-risk population for management that prevents the development of complications.

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Introduction

Congenital hip dislocation (CHD) is one of the most common congenital skeletal anomalies with a worldwide incidence ranging from 0.1 to 10% of live births (1). It represents a public health problem because of its high frequency, the physical handicap it causes at walking age, and its natural progression to coxarthrosis (2).

The incidence of congenital hip dislocation is variable and depends on many factors, including ethnic, geographic, and genetic background for its frequency in certain families or ethnic groups (2,3). Indeed, CHD can often affect multiple individuals in the same family across generations with a 12-fold increase in CHD in first-degree relatives of affected individuals (4).

Furthermore, CHD affects mostly girls, 90% of (5). This pathology affects girls 4 to 6 times more often than boys (6). Other risk factors reported in the literature, mainly mechanical factors that lead to fetomaternal conflict during late pregnancy. These factors are related to primiparity, macrosomia, breech position, twin pregnancies, and oligohydramnios that can trigger dislocation (7).

According to a report by the High Authority for Health (HAH) in 2013, knowledge of risk factors and early diagnosis of CHD in the neonatal period allows for simpler, more effective, less aggressive, less time-consuming, and less expensive treatment (5).

In Morocco, studies on congenital dislocation of the hip seem to be rare, with a lack of epidemiological data and analysis of risk factors associated with this congenital malformation at the national and regional levels. Indeed, all the studies carried out were interested in the evaluation of the diagnostic approaches and therapeutic management of the anomaly before and after the age of walking in the pediatric trauma and orthopedics departments of the university hospitals of Fez, Rabat, and Marrakech. Hence the interest of this work aims to study the detection of congenital hip dislocation and to analyze the risk factors associated with this congenital malformation in Morocco.

Subjects and methods

Target population and sampling. This is a retro-prospective epidemiological study that targeted 160 children at the

mother-child hospital of the Mohamed VI university hospital of Marrakech. The study population consisted of 120 children who had confirmed congenital hip dislocation and 40 children who were confirmed healthy after the examination. The 40 healthy cases were studied to analyze the risk factors associated with the occurrence of congenital hip dislocation received at the Mohamed VI University Hospital Marrakech, Morocco.

The study excluded children with CHD associated with cerebral palsy or poly-malformation syndrome and patients whose records were not usable. The sample of children participating in the study was probabilistically simple and random.

The choice of the pediatric orthopedic trauma service of university hospital Mohamed VI was justified by the specialization of this service in the management of children with CHD and also because it represents the third-level reference care structure that receives patients from the central and southern regions of Morocco.

Data collection and processing. Based on an exploitation form of the hospital files. This form allowed the collection of risk factors and various epidemiological, clinical, paraclinical, therapeutic, and evolutionary data from the patients' files. 160 files were exploited with a 5-year delay, between 2016 and 2021.

A pre-test was performed before the validation of the data collection tools to detect areas of misunderstanding and to make any corrections to the data collection tools.

Ethical considerations. The study was conducted after obtaining authorization from local and regional health departments (Reference No. 888/2021).

Ethical aspects such as anonymity and confidentiality were respected.

Data analysis. To obtain results on the association between risk factors and the occurrence of congenital hip dislocation in our population, we opted for the Chi2 test which resulted in significantly lower than 0.05 for a set of variables studied.

Results

Socio-demographic characteristics of the patients. The patients participating in the study were all of Moroccan nationality, whose ages ranged from seven months to 14 years with a predominance of children under 4 years of age in 65% of cases. Regarding the place of residence, the study shows that 66.7% of the cases reside in an urban area, while 33.3% are of rural origin.

Regarding the place of origin, most of the children with a percentage of 76% come from the Marrakech-Safi region, of which 38% live in the city of Marrakech, 13% of the patients in our sample come from the southern region of Morocco (Guelmim-Oued noun, Dakhla-Oued-eddahab, Souss-Massa, Laayoune-Sakia el Hamra). In addition, 11% come from the central regions of the country (Casablanca Settat, Drâa-Tafilalet, Béni mellal-Khénifra) (Fig. 1). Our series is representative since it is made up of a population belonging to eight of the 12 health regions of Morocco. As for the distribution according to sex, the majority of the population studied are girls with a percentage of 69.2%. While 37 patients are male which represents 30.8% of cases.

Clinical characteristics of the patients. The results obtained show that 56.7% of the mothers are primiparous, while 43.3% are multiparous of which 28% have 2 to 3 children and 24% have four or more children. As for consanguinity, only 31.7% of the children with CHD were from a consanguineous marriage.

The results reveal that the vast majority of children with CHD (97%) were born at term, while just 1.7% were born prematurely. The vast majority of children with CHD (88.3%) had a normal birth weight, while 8.3% of children were born macrosomic and 3.3% were hypotrophic. In 74% of cases, the reason for consultation was the appearance of a painless lameness, followed by painful lameness with a percentage of 17% (Table I).

Regarding the parental history of CHD, the results shows that the vast majority of children (78.75%) have no family history of CHD while 21.26% of affected cases have a family history: siblings (13.13%), father (6.25%), mother (1.88%) (Fig. 2).

Diagnosis, management, and evolution of the pathology

Reason for consultation. To identify the reasons for consultation, we obtained the following reasons, which we coded from 1 to 5 in the following order: care of another malformation, painless lameness, painful lameness, birth consultation, and systematic consultation. The results show that the majority of them consulted following the appearance of a painless lameness (Table II). It is obvious from the table that the majority of them consulted following the appearance of a painless lameness.

Diagnosis circumstances of congenital hip dislocation. Reading the results shows that the vast majority of affected children 95% are not diagnosed at birth, most children 63.3% were diagnosed between 6 months and 18 months, and 65.8% of children with CHD were first diagnosed by a pediatrician. For the means of diagnosis, 87.5% of children with CHD were diagnosed by a clinical examination supplemented by an X-ray. In addition, 26.7% of patients suffered from one or more congenital malformations. 91% of affected cases were consulted after the onset of lameness with or without pain (Table III).

The treatment implemented. The results show that 28.75% of the children with CHD received orthopedic treatment, followed by surgical treatment. While 41.87% of the children were treated directly by surgical treatment (Fig. 3).

Evolution of the pathology after treatment. From our results, we can see that 37% of the children with CHD were cured, while 28% of the children had complications. Acetabular dysplasia is the most dominant complication with a percentage of 11% (Fig. 4).

Associated factors. Statistical analysis of the data shows the existence of a positive and significant correlation between the onset of CHD and consanguineous marriage (P=.023), female gender (P=.000), primiparity (P=.015), history of CHD in the family (P=.002) and birth weight (P=.000) (Table IV).

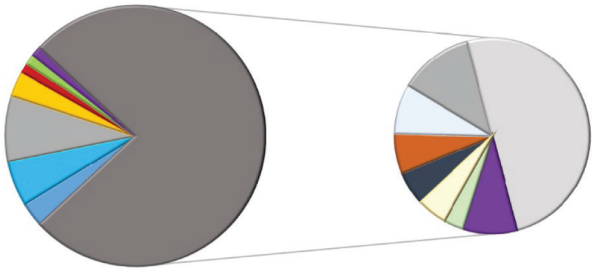

Figure 1. Distribution of children with CHD according to their origin.

Discussion

Concerning sex, the female sex is predominant in our study with a portion of 69.2%, which is similar to the results of the study of Frotier (8), which showed that 80% of the affected children are female. This confirms the predominance of congenital hip dislocation in the female sex. Indeed, girls are affected 4 times more often than boys (9). The predominance of females is a fact confirmed by the majority of authors. Therefore, the female sex should be considered as a risk factor in its own right, since girls may account for up to 90% of late-diagnosed cases of congenital hip dislocation (5).

Regarding the family antecedent risk factor, it was found in the siblings in 13.13% of the population, in the father in 6.25%, and in the mother with a proportion of 1.88% of cases (Fig. 2). In the literature, the risk of CHD in a child is estimated at 6% when there is an affected sibling, 12% with an affected parent, and 36% if one parent and one sibling are affected (10).

Primiparity is cited as a risk factor by many authors with a percentage of 51 to 63% of CHD for a rate of 40% in the general population (11), These results are almost the same as those of our study where we found that primiparity is the second incriminated risk factor after female sex, with a percentage of 56.7%.

Regarding the term of birth, the results show that 98.3% of the newborns were born at term, while only 1.7% were born prematurely. In the study of Di Pizio (12), it was found that 65.58% of children with CHD were born at term and 34.41% were born prematurely in a series of 159. These results revealed that preterm birth seems to be a protective factor against CHD. According to the literature, the dislocation would be formed at the end of pregnancy, especially in case of fetomaternal conflict, which may explain its unusual character in the premature baby.

In the literature, infants born breech by cesarean section have a significantly lower risk of CHD compared with those born vaginally (13,14). These results converge with those reported in our study in which only 32.5% of children with CHD were born by cesarean section. This could be explained by the fact that cesarean delivery is often indicated in cases of mechanical dystocia (breech presentation, macrosomia, twin pregnancy, etc.). This says that there would be more CHD in the case of a cesarean section although the anomaly does not result from the mode of delivery but from another underlying factor (13).

According to many authors, macrosomia, like breech presentation, is a mechanical factor in congenital hip dislocation. For Peschgens *et al* (15), macrosomia in a newborn should be classified as a risk factor for the development of hip dysplasia; hypertrophic newborns should be examined post-partum for a developmental disorder of the hip joint. However, the present study revealed that the number of macrosomic children is very low with a percentage of 8,3%. Therefore,

Table I. Distribution of patients with congenital hip dislocation by clinical characteristics.

Clinical characteristics	N	%
Parity		
Primiparous	68	56,7
Multiparous	52	43,3
Number of children/woman		
<3 children	28	53,8
4 children and more	24	46,2
Consanguineous marriage		
Yes	38	31,7
No	82	68, 3
Term of birth		
Premature birth	2	1,7
At term	118	98,3
Birth weight		
Hypotrophy	4	3,3
Normal	106	88,3
Macrosomia	10	8,3
Intrauterine presentation		
Breech	33	27,5
Cephalic	87	72,5
Mode of delivery		
Vaginal delivery	81	67,5
Cesarean section	39	32,5
Side affected by congenital hip dislocation		
Left	31	56,7
Right	21	25,8
Bilateral	68	17,5
Total	120	100

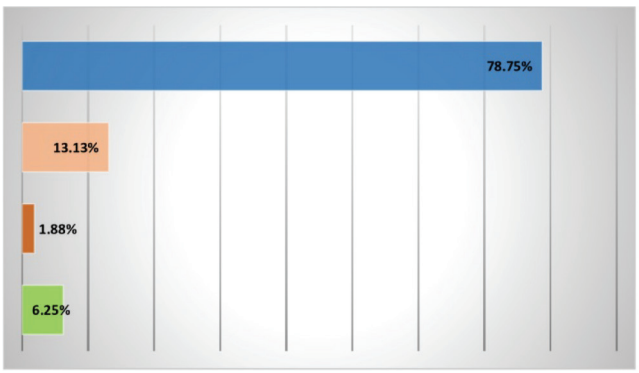

Figure 2. Distribution of children according to family history of CHD.

Table II. The distribution of children with CHD according to their reasons for consultation.

Reasons for consultation	N	%	Cumulative percentage
1. Care of another malformation	5	4,2	4,2
2. Painless lameness	88	73,3	77,5
3. Painful lameness	24	20	97,5
4. Birth consultation	1	0,8	98,3
5. Systematic consultation	2	1,7	100
Total	120	100	

Table III. Distribution of patients according to the circumstances of diagnosis of CHD.

Circumstances of diagnosis	N	%
Maternity screening		
Yes	114	95
No	6	5
CHD diagnosis age		
<1 month	3	2.5
<6 months	10	8.3
Between 6 and 18 months	76	63.3
>18 months	31	25.8
Who made the diagnosis (profile)		
Pediatrician	79	65.8
General practitioner	37	30.8
Midwife	4	3.3
Means of diagnosis		
Clinical + Radiographic	105	87.5
Clinic+ Ultrasound	13	10.83
Clinic+ Radiographic+ Ultrasound	2	1.66
Presence of associated congenital malformations		
Yes	32	26.7
No	88	73.3
Reason for consultation		
Painful lameness	20	17
Painless lameness	89	74
Systematic consultation	4	3
Management of another malformation	7	6

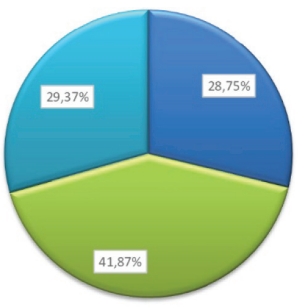

Figure 3. Distribution of children with CHD according to the nature of the treatment implemented.

Table IV. Association of risk factors with congenital hip dislocation.

The variables	%	χ^2 value	P-value
Consanguineous marriage	31,7	7,563	0,023
Family history of CHD	21,26	16,814	0,02
Femal gender	69,2	46,222	0,00
Primiparity	56,7	5,876	0,015
Normal birth weight	88,3	15,986	0,00

We formulate our basic hypotheses:
H0: The onset of CHD and the risk factor studied are independent;
H1: The occurrence of CHD and the risk factor studied are not independent;
This table shows that the p-value of the variables studied is lower than 0.05, therefore we reject HO and we note that indeed there is a relationship between these variables and the appearance of congenital hip dislocation.

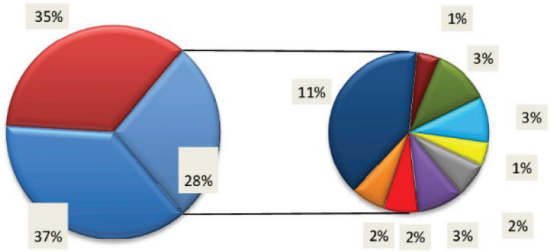

Figure 4. The distribution of children with CHD according to the evolution of the pathology.

macrosomia as a risk factor was statistically less significant in our series. The incidence of CHD in our context is associated more with a normal birth weight with a proportion of 88.3% of cases, which converges with the findings of Hanratty *et al* (16), which invalidates the influence of macrosomia on the occurrence of congenital hip dislocation.

The association of congenital hip dislocation with other postural abnormalities is widespread. In the present study, 26.7% of children with CHD had postural deformities, including 13.7% varus equinus clubfoot, 4% Congenital Torticollis, 5% Spina Bifida, and 4% other deformities. Other authors have pointed out that genu recurvatum and torticollis are orthopedic anomalies that can be associated with

CHD (3,6). This association varies between 8 and 20% of cases with congenital hip dislocation (17).

According to our results, the proportion of children who were diagnosed by clinical and radiographic examination represents the majority (87.5%). From these results, we can see that radiography is the preferred means of screening and monitoring CHD. However, the Higher Authority for Health (5), emphasizes that radiography at birth has no place in the screening of CHD except in the case of clinical signs of dislocation, or at the fourth month (3 months of age) in subjects with 'at-risk' hips. Ultrasound is considered to be the method of choice and is indicated if there are clinical signs or risk factors.

For the circumstances of diagnosis of CHD (Table III), in our series, the diagnosis was made late in 61% of cases; 34% of children aged between 12 and 18 months; and 27% between 6 to 12 months. These results are similar to those reported by an observational study conducted in 2010 under the aegis of the SOFOP (French Society of Pediatric Orthopedics) which revealed a significant increase in late diagnoses of CHD made after the age of one year (11). According to our results, late screening for congenital hip dislocation was done in 91% of cases following the onset of lameness with or without pain (Table III). On the other hand, when CHD is discovered late, the treatment is often surgical with long treatment duration and more serious complications (5).

Many studies show that diagnosis and treatment in the neonatal period guarantee a cure in most cases. Early diagnosis is considered relatively simple and safe, and it provides generally effective treatment. with good results in about 96% of cases (18). These findings converge with our results where we found that 58% of cases with CHD benefited from orthopedic treatment, and 28.75% of these cases are operated on after failure of the first treatment. Whereas 41.87% of cases, whose screening age is over 18 months, benefited from immediate surgical treatment (Fig. 3). For the evolution of the treatment implemented, a proportion of 28% of children with CHD had complications, such as acetabular dysplasia which is the most dominant with a percentage of 11% followed by osteochondritis in 3% of cases (Fig. 4).

Limitations of the study. The study was limited by the analysis of the variables found in the hospital records used. It would be important to analyze other risk factors found in the literature, such as swaddling, which is not mentioned in the records. We are increasing this option in the actual research.

Conclusion

In our study context, congenital hip dislocation results from a multitude of factors dominated by the female sex, primiparity, family history, birth weight, and consanguinity. Prior identification of these risk factors makes it possible to determine the population prone to the anomaly for early diagnosis and safe and quality care while acting on the incidence of complications of this congenital anomaly. Studies on a larger population affecting the whole of the national territory will make it possible to study the correlation between the appearance of CHD and these risk factors and to set up screening registers for monitoring the population at risk.

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Author contributions

AI: contributed to the conception and design of the protocol, writing of the article. I, BS: contributed to all experimental work, data and statistical analysis and interpretation of the data. TO: Revised and critically read the manuscript, final validation of the version to be published. All authors read and approved the final manuscript.

Ethical statement

Ethical approval: The Higher Institute of Nursing and Health Techniques, Marrakech, Morocco approved our research, and consent was not obtained from the participants, but we had the authorization of the health authority of Marrakech.

Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that might have appeared to influence the work reported in this article.

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