

Research Article

Association between Flat Feet and Hip Development Dysplasia in Children Aged from 4 To 14 Years

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Summary

Objective: To determine the association between flatfeet and hip development dysplasia in children aged from 4 to 14 years old.

Method: This is a retrospective cross-sectional descriptive study, in which the inclusion criteria are children between 4 and 14 years of age, from the city of Bogotá and Soacha from the Cardiovascular Hospitals, Central Hospital of the Police and Clínica Colombia, who attend to consultation of children's orthopedics; A homogeneous sample of 150 patients was taken for this study.

A chi-squared test or Pearson distribution was used, using contingency tables and analyzing qualitative variables.

The ratio of cross products or was determined, determining the probability of developing flat feet with the presence of HD.

Results and conclusions: We performed a qualitative analysis of this chi square calculated of 13.876, which is superior to the tabular with degree of reliability of the study of 99%. We identified a p-value of 0.00800765 with asymptotic significance, P less than 0.01, Which confirms the hypothesis of association between the two variables in patients between 4 and 14 years of age in the studied population.

With this study, we were able to determine an OR of 3.8 by calculating the probability of 79% more times of developing flat feet with the history of hip development dysplasia by previously analyzing the ratio of probabilities and the ratio of cross products of these two variables. However, it is possible that there is a spurious relationship between Hip Dysplasia and flatfeet, which requires subsequent studies of multivariate analysis to determine the real associations of these variables and define modifiable risk factors to develop these pathologies.

Keywords: Dysplasia; Hips; Loose flat; foot; Plantar arch.

Introduction

The flat feet is one of the most frequent pathologies during the general orthopedic consultation and especially in the infant orthopedic consultation, being the largest population between 4 and 7 years old with a 43% incidence of flat feet and decreasing progressively between 7 until the age of 14, to 13% [1].

The natural history of flatfeet is unknown, although some studies suggest that most flat feet are asymptomatic in adulthood. Flat feet may exist as an isolated condition or may be associated with a broader clinical entity which may be ligament laxity, neurological or muscular abnormalities, genetic conditions and collagen disorders [2].

Variables related to flat feet have been identified: male sex, younger age, overweight and obesity among others [3].

As described by Dr. Rivera_Saldivar et al. in their study where it is determined that obesity is a determinant factor for the development and formation of longitudinal and medial plantar arch in the flatfeet in school-age children in Mexico, taking into account as variables weight, age and shape of the pedigrum during the stage of its growth and its association with presence of symptoms [2].



Figure 1: Clinical evidence of flatfeet in a 5-year-old preschooler with a history of HD.

Additional studies emphasize the importance of flatfeet control and its adequate management associated with biomechanical alterations to the extremities and the long-term presence of joint damage in the lower limbs as causes of early osteoarthritis [4]. Kothary and colleagues in their study identify the association of a non-early control of flat feet can develop mid and long term lesions in proximal joints of lower limbs generating lesions such as pelvic retractions and knee valgus deformities with subsequent deterioration of them [5]

Raó et al. Identify in their studies in India that a large amount of population that uses closed shoes are those that present a greater incidence of flat feet against other type of patients who use sandals and that even is surpassed significantly by children population that never used any type of footwear [3]. The persistence of symptoms during these ages are of concern for the majority of parents and relatives of these children who, after physical activity, have pain in the plantar region, legs and knees, which are reasons for consultation, however they have not been established clearly modifiable and non-modifiable risk factors for the flatfeet in this population, although this clinic is frequently related to a history of Hip Development Dysplasia and its various degrees of severity.

Hip Development Dysplasia of in Colombia is a pathology that is being diagnosed more frequently day after day due to the screening process and the public health legislation in patients with risk factors of this pathology, we have frequently found in our environment presence of school-age children with flat feet clinic associated with a history of hip dysplasia, during the accomplishment of this study few articles were found that speak of the relation of these two variables. Hip dysplasia along with flat feet are pathologies that have been studied gradually in our environment in depth, which is why other studies have been developed that in-

vite these associations and determine other variables that can be correlated with these two diseases. Ponce de León Samper in his study analysed these variables of Dysplasia of the development of hip and flat feet, and generated a large number of questions in this respect, therefore the Ponce study served as support for the realization of this research, where the idea is search for results and clearer conclusions that may lead to some degree of recommendation and to protocolize processes as risk factors in these pathologies [6].

The general objective of this study is to identify the association between flatfeet in the school population in children aged from 4 to 14 years associated with a history of Hip Development Dysplasia as a predictive factor and prognosis of the symptomatology of this pathology [7] and as a determinant of biomechanical alterations of lower limbs and, consequently, of mid and long-term deforming pathologies [5].

Materials and Methods

It is a descriptive, cross-sectional, retrospective study whose inclusion criteria are children between 4 and 14 years of age, from the city of Bogotá and Soacha of the Cardiovascular Hospitals, Central Hospital of the Police and Clínica Colombia, both female and male, who attend an orthopedics outpatient consult, with a flat feet clinic associated with a history of hip dysplasia. 150 patients were taken from these medical centers, a retrospective history of hip dysplasia was verified by means of the clinical history and a flat feet clinic was confirmed in the orthopedic consultation; Homogeneous samples were taken in number of these 3 institutions, Hospital of the Police (45 patients) Soacha Cardiovascular Hospital (52 patients) and Clínica Colombia (53 patients) with similar socioeconomic, cultural, genotypic and phenotypic characteristics that met inclusion criteria Age, signed consent and authorization to participate in the study [8].

To the studied population, we analysed variables such as degree of symptomatology of flat feet clinic, gender, age, and history of hip dysplasia. The alternative hypothesis was formulated where there is an association between HD and flat feet and formulating a null hypothesis, where there is no association between these two variables. The statistical program was used with analysis of variables in EXCEL table, with chi square test or distribution of Pearson, using contingency tables and analysing qualitative variables by means of tables of frequencies observed and tables of frequencies expected to determine the continuous probability with the determined variables of flat feet, that represents the degrees of freedom of a random variable, where the variable dysplasia and flatfeet are normal random variables independent of mean zero and variance one.

The ratio of cross products or ORs with exposed and non-exposed groups to the history of dysplasia and a control group with no history of dysplasia and no clinical presence of flat feet were determined, determining the probability of developing flat feet with the presence of HD. Statistical significance was set at

p <0.01. There were mean differences between groups with 99% confidence intervals (IC).

Results

Of the 150 patients, a representative sample of the hospitals linked to the study, 102 patients reported having a flat feet clinic, confirming with physical examination during the consultation of Children’s Orthopaedics, observing a decrease in longitudinal plantar arch and presence of a back foot in valgus, of which 78 patients had a history of hip dysplasia, 24 had no history of HD. In the sample of 150 patients; 100 patients had a history of hip development dysplasia, of which 22 patients did not present a flat feet clinic and 26 patients were part of the control group, with no history of HD, nor a flat feet clinic.

We performed a chi square analysis of 13,876, taking into account the degree of freedom of 1, and chi square according to the degree of reliability of the study of 99%, we identified the ratio of tabular chi square is 6.6349, the calculated chi being greater than the tabulated chi square.

Hip Development Dysplasia				
		Yes	No	Total
Flat	Yes	78	24	150
Feet	No	22	26	
X2: 13,8; GL: 1; P: 0 >01 OR: 3.8; Probability 16%				

Table 1: Association between flatfeet and hip development dysplasia.

We identified a p-value of 0.00800765 with asymptotic significance, less than 0.01, which indicates that it has statistical significance. Odd Ratio is calculated in 3.8, taking into account the 2 variables, a group with a history of HD, a group with flat feet and the control group and relation with exposed and unexposed groups. A 79% more chance of developing flat feet associated with a history of hip development dysplasia was determined.

Gender	Number of patients	%
Male	88	58
Female	62	42
Total	150	100%

Table 2: Distribution of cases according to gender

It was found that of the 150 patients enrolled in the study, 88 patients were female and 62 male patients, representing 58.7% and 41.3% respectively of the global study sample.

For age groups we found a distribution during the statistical analysis, of the 150 global patients in the study, 82 patients (54%) were in the range of 4 to 10 years and 68 patients (45%) between the ages of 10 and 14 years old. In the sample of patients between 4 and 10 years old the age distribution was as follows: (4 years: 18 patients (21.9%), 5 years: 12 patients (14%), 6 years: 8 patients

(9.7%), 7 years: 10 patients (12.1%), 8 years: 14 patients (17%), 9 years: 11 patients (13%), 10 years: 9 patients (10.9%). In the sample of patients between 11 and 14 years old the age distribution was as follows: (11 years: 15 patients (22%), 12 years: 21 patients: (30%), 13 years: 17 patients (25%), 14 years: 15 patients (22%).

Discussion

In the present investigation, as well as in that carried out by Ponce de León (), a significant association between flat feet and hip dysplasia was found. This finding is particularly important in the sense of alerting the careful search for the first pathology when the latter is diagnosed, or vice versa, in order to provide the patient with a more comprehensive and better-quality care.

Whether the association mentioned above is real or whether it is determined by the relation of the two pathologies to an unidentified factor and which precedes them (spurious association) persists. From a theoretical point of view, it could be thought that there are many factors that could be associated with the two pathologies and that precede them, motivating their association. These factors include: genetic, fetal presentation, uterine height, anatomical conformation of the uterus, pelvic circumference, height of the mother, endocrine, etc.

From a preventive point of view, it would be of the utmost importance to establish, through analytical studies, whether one or more of the factors mentioned correspond to risk factors of the two pathologies studied. Thus, the approach of the same would begin with the identification of risk factors, whose management could prevent its occurrence. Undoubtedly, this would be an outstanding contribution to scientific knowledge and prevention of these pathologies, of high frequency in the population.

Age Group	Number of patients	%
4 to 8 years old	88	58
11 to 14 years old	62	42
Total	150	100%

Table 3: Distribution of cases according to age group

Conclusion

We can conclude from this study that the alternative hypothesis that affirms that there is a relationship between flat feet and hip development dysplasia in patients between 4 and 14 years of age in the studied population is true, confirming this hypothesis.

With this study, we were able to determine the probability of 79% more times of developing flat feet with the history of hip development dysplasia by previously analyzing the odds ratios and the cross-product ratio of these two variables, calculating the OR of this study. From this study, we highlight that there is a high number of cases in the female gender in relation to the male with a presence of flat feet related to dysplasia of the hip development in the global population of the sample.

It was evidenced in the study that the distribution of number of cases between flat feet and hip development dysplasia was greater in the age group between 11 and 14 years, being at the age of 12 years old the point of greatest prevalence of cases. It was identified that within the general sample of the study there is a greater number of patients with hip development dysplasia that present flat feet associated to symptoms.

Recommendations

Based on the results of the research, it is recommended that the national and international scientific community carry out analytical studies (Cohorts and Cases and Controls) to identify risk factors for the pathologies studied, with hypotheses based on the factors indicated in the Discussion of this document.

Likewise, it is recommended to incorporate in the protocols of clinical and therapeutic management the systematic search for the two pathologies, when the presence of one of the two is identified.

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