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PARTICULARITIES OF POLYDACTYLY IN BIHOR COUNTY

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Abstract

Congenital digital anomalies represent somatic genetic markers because their presence shows the presence of genetic mutations, and genes that control limb development and digital development play an important role in embryogenesis at the level of the whole organism. Currently there are known 84 genes implicated in the etiology of congenital digital anomalies. Polydactyly is a congenital digital anomaly defined by the presence of supernumerary fingers or toes. From genetic point of view polydactyly has a very diverse ethology some of the cases are isolated, some of them are recurring in families and some of the cases are part of a genetic syndrome along other congenital malformations. In the present paper we study from clinical and genetically point of view the cases of polydactyly from Bihor County over a period of thirty years (1987-2017).

Key words: polydactyly, somatic genetic markers, genetic syndromes with polydactyly

INTRODUCTION

Congenital digital anomalies can be of genetic, non-genetic (teratogens, amniotic constriction band syndrome) or of unknown causes. The most frequent congenital digital anomalies are polydactyly, syndactyly, brachydactyly and oligodactyly. The classification proposed by Swanson and adopted by the International Federation of Societies of Hand Surgery is as follows: type 1 – failure of formation (oligodactyly), type II – failure of differentiation (syndactyly), type III- duplications (polydactyly), type IV – overdevelopment (macrodactyly), type V – underdevelopment (brachydactyly), type VI – amniotic band constriction syndrome, type VII- generalized anomalies.

Polydactyly is defined as the presence of one of more supernumerary fingers at the level of the hands and/or feet. It can be pre-axial, postaxial or central. It can be transmitted autosomal dominant with incomplete penetrance and variable expressivity. The anomaly can be part of a syndrome. The syndromes where we can find polydactyly are: Ellis von Creveld syndrome, trisomy 13, Bardet-Biedl syndrome, Smith-Lemli-Optiz syndrome, Greig syndrome.

MATERIAL AND METHOD

We conducted a statistic retrospective study about children with polydactyly that are in evidence at the Genetic Regional Centre Bihor. We consulted their medical files from the first admission, and we analysed the clinical and genetic data. The inclusion criteria in the study were the presence of supernumerary digits whether they were at the level of the upper limb or lower limb, unilaterally or bilaterally.

RESULTS AND DISCUSSIONS

From the total of 27 children with polydactyly included in the study the majority presented isolated polydactyly, 20 cases (74.07%), and the other presented associated polydactyly (fig.1).

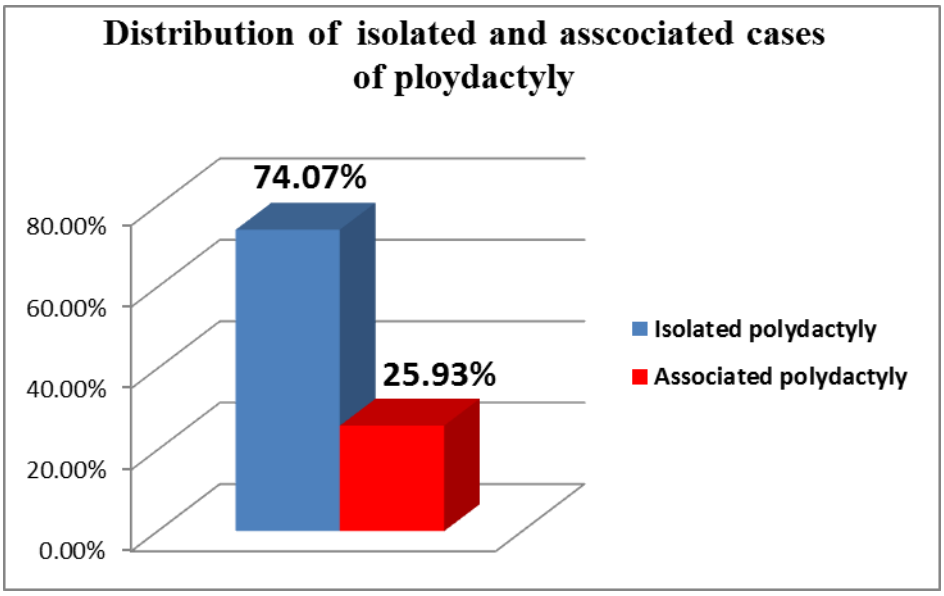

Fig.1. Distribution of polydactyly cases in Bihor County

We identified the fallowing repartition of the cases: polydactyly without positive family history, 17 cases (63%), autosomal dominant transmitted isolated polydactyly with positive family history, 3 cases (11%), associated polydactyly, random associations, 2 cases (7%), associated polydactyly, random associations, autosomal dominant transmission, 2 cases (7%), combined polydactyly one case (4%), syndromic polydactyly, 2 cases (7%) (fig. 2, fig. 3)

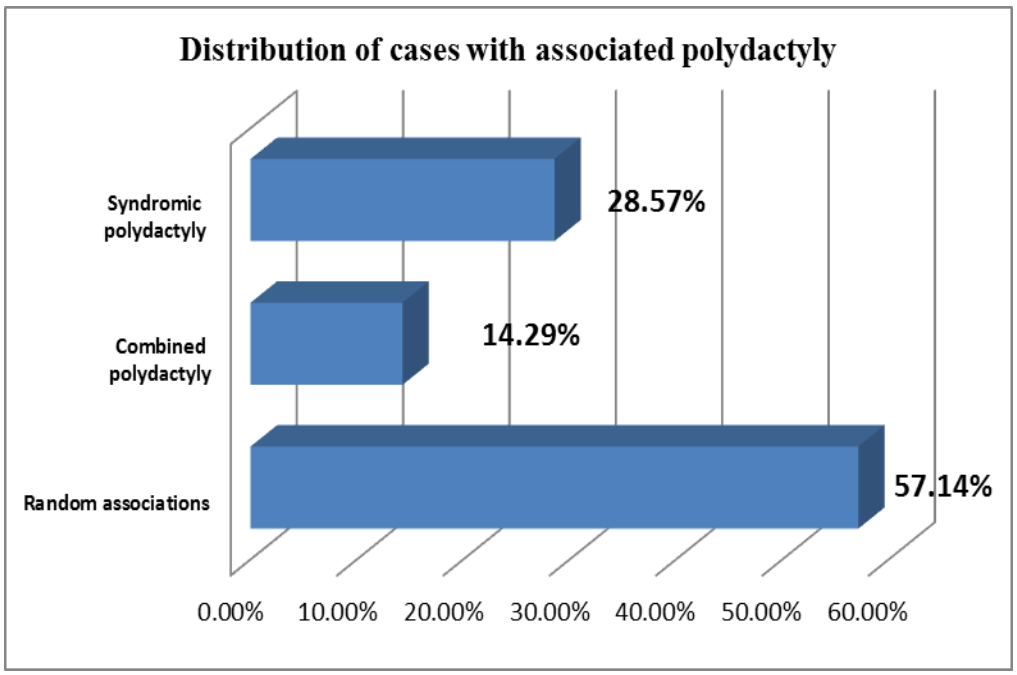

Fig.2 Distribution of different types of associated polydactyly

Isolated polydactyly is characterized by the presence of supernumerary digits without other associated congenital malformations, can appear for the first time in the family or in that family can exist other members with polydactyly. If the family history is positive we classify the case as isolated polydactyly with autosomal dominant transmission.

Data from literature specifies several genes implicated in autosomal-dominant polydactyly, and the most frequent cited is GLI3. GLI3 mutations are implicated in the apparition of isolated preaxial, postaxial, but also syndromic polydactyly. Another possibility is the implication of teratogen factors in the etiology of polydactyly.

From clinical point of view in the case of isolated polydactyly there are some differences concerning isolated polydactyly without positive family history and polydactyly with positive family history.

In the cases without positive family history we observed that in 67% of cases the anomaly appears unilaterally at the level of inferior limbs (fig.4). Polydactyly appears as a result of the mutations of genes that influence development on anterior - posterior axis, in the cases of the lack of presence of family history it remains open the question about the great incidence of cases where the anomaly appears unilaterally suggesting the presence of haploinsufficiency of genes that control limb development, or the existence of teratogens that intervene during pregnancy.

In the cases with positive familial history, the anomaly appears in all the cases bilaterally, at the level of upper and lower limbs, respectively only at the level of inferior limbs bilaterally (fig. 4). This suggests that proteins coded by genes are present in a very low quantity leading to a more severe phenotypic manifestation.

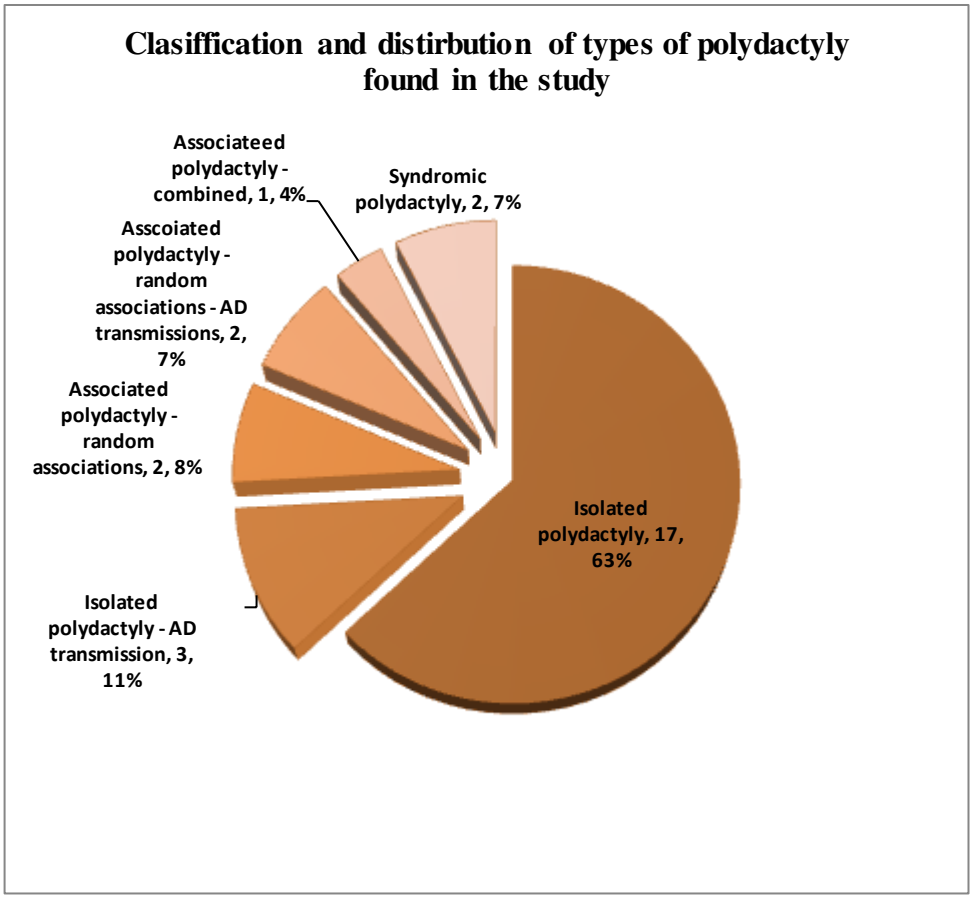

Fig 3. Procentual representation of cases included in the study classification

Associated polydactyly was distributed as syndromic polydactyly, meaning polydactyly accompanied by congenital anomalies that together constitute a genetic syndrome, combined polydactyly, meaning polydactyly accompanied by a congenital anomaly that affects upper or lower limbs but it is not located at the level of the fingers and together does not constitute a genetic syndrome, for example polydactyly at the level of the left hand and hemimelia at the level of the right hand and random associations, polydactyly accompanied by other anomalies that are not located at the level of the upper limbs or lower limbs and do not constitute a genetic syndrome

for example the presence, in a child, of polydactyly and cutaneous hemangioma.

Regarding associated polydactyly we had a case of polydactyly at the level of the left foot with hemimelia of the left leg.

Associated polydactyly - random associations were present in four cases.

The first one was a case of bilateral hand polydactyly, bilateral foot polydactyly associated with a cardiac congenital a-cyanotic heart malformation, and grade I hypospadias.

The second one was a case of postaxial bilateral polydactyly at the level of feet associated with bilateral congenital nephropathy with pielo-caliceal dilatation.

The third case was represented by postaxial polydactyly at the level of the hand and polydactyly at the level of right foot with cutaneous hemangioma and the fourth one polydactyly and dwarfism. It is worth to mention that the first case had familial history of polydactyly which means that it is a case of polydactyly with autosomal dominant transmission that had associated a cardiac and a renal malformation. We do not know if the affected individuals from the previous generations had only polydactyly or had polydactyly and the other associated malformations which would lead to a reclassification of the case as syndromic polydactyly.

Syndromic polydactyly in Bihor County represents a real surprise from genetic point of view. From the many types of genetic syndromes that manifest with polydactyly, in Bihor County we found only two cases of Bardet-Bidle syndrome.

The first case was a girl diagnosed with Bardet-Bidle syndrome, born on term, the fourth child of healthy parents, with positive family history having a brother diagnosed with Down syndrome and another two healthy brothers, she presented clinically the fallowing: face dimorphism, round face, convergent strabismus, thin lips, micrognathism, downward sloping lip corners, anomalies of pavilions of the ears, bilateral hand postaxial polydactyly, polysyndactyly at the level of the left foot. The patient developed normally until 3 months when she developed hyperphagia with weight gain.

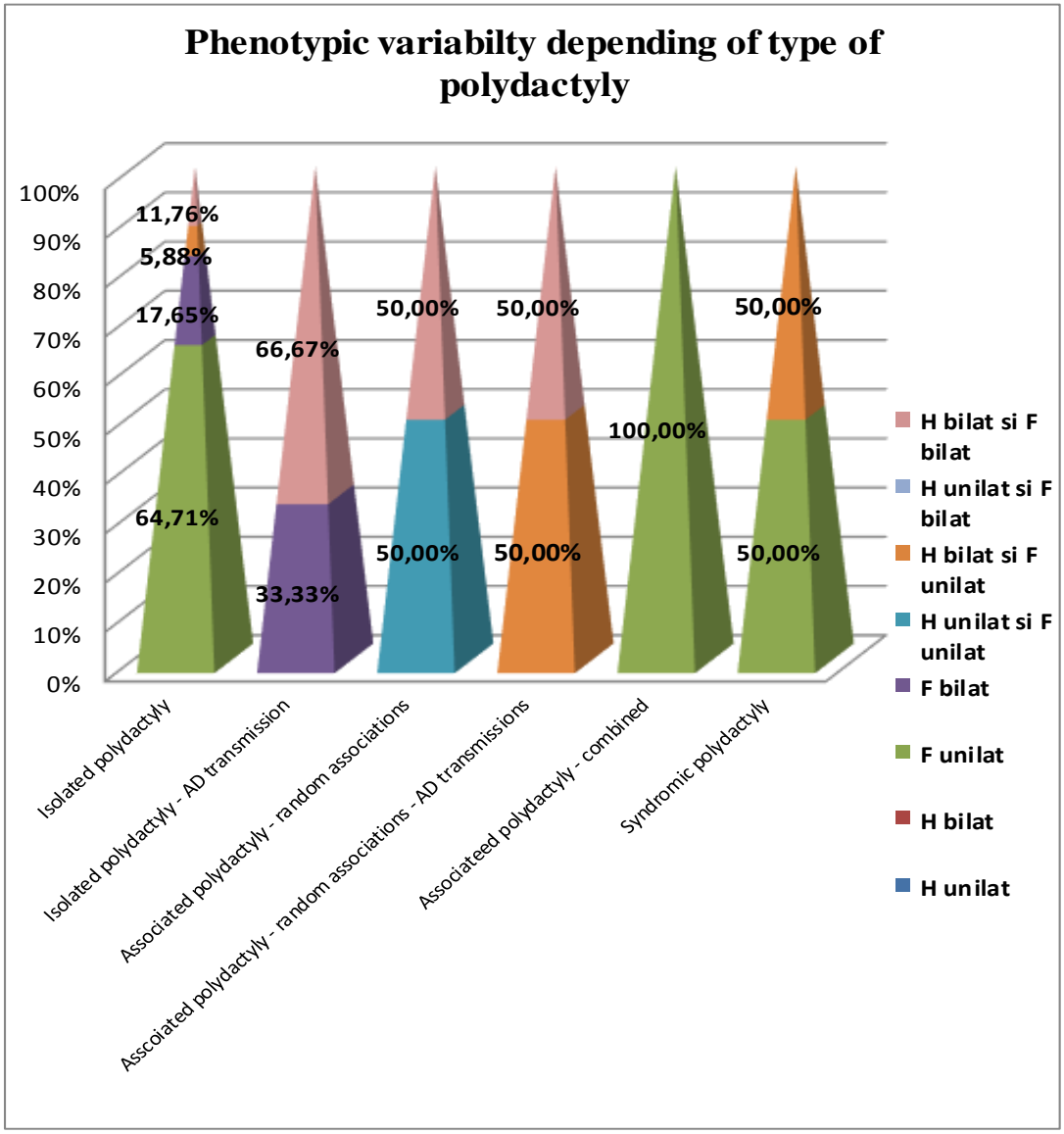

Fig.4. Phenotypic manifestations of polydactyly depending on its type (H-hand, F-foot)

Ophthalmologic examination revealed incipient pigmentary retinitis. Psychological exam revealed medium mental retardation. So the diagnosis of Bardet-Bidle syndrome was made based on two primary criteria (obesity, pigmentary retinitis, bilateral postaxial polydactyly at the level of the hand, polysyndactyly at the level of the left foot), and two secondary criteria (mental retardation, convergent strabismus). The second case was a boy with bilateral polydactyly, mental retardation, pigmentary retinitis, facial dimorphism and hypogonadism.

CONCLUSION

In Bihor County we observed that isolated polydactyly predominates among other types of polydactyly. Therefore we can state that polydactyly in a new-born does not represent a signal of alarm about the presence of a genetic disease with severe prognosis and that can impact significantly the quality of life. Syndromic cases are rare and are accompanied by evident malformations at the clinical examination; in our study we found only two cases of Bardet-Bidle syndrome that had associated severe manifestations like mental retardation. However, follow-up of cases with polydactyly has importance, especially to find if the anomaly reappears in the further generations.

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