



## Growth impairment of children with different types of lip and palate clefts in the first 2 years of life: a cross-sectional study

*Prejuízo no crescimento de crianças com diferentes tipos de fissura lábio-palatina nos 2 primeiros anos de idade. Um estudo transversal*

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### Abstract

**Objective:** To analyze the differences in growth impairment according to sex in the 2 first years of life in children with three types of clefts.

**Methods:** This was a cross-sectional study of 881 children (58.9% boys and 41.1% girls) with cleft lip and palate treated at the Craniofacial Anomaly Rehabilitation Hospital, (University of São Paulo, Bauru, SP), Brazil. Age ranged from 1 to 24 months. Three types of clefts were evaluated: isolated cleft lip (181/20.5%), isolated cleft palate (157/17.8%) and cleft lip + palate (543/61.6%). Weight and length measurements and data regarding breast-feeding and socioeconomic level were obtained. Children with weight and length below the 10th percentile of the NCHS reference were considered to have impaired growth.

**Results:** Sample distribution according to cleft type and sex was similar to that observed in other epidemiological studies. Breast-feeding was more frequent in the isolated cleft lip group (45.9%) than in the isolated cleft palate (12.1%) or cleft lip + palate group (10.5%). Isolated cleft lip children showed less marked impairment of weight (23.8%) and length (19.3%) compared to the cleft lip + palate group (35.7% and 33.1%, respectively). In the latter group, the proportion of children with weight and length below the 10th percentile was very close to that of the isolated cleft palate group (34.4% and 38.9%).

**Conclusions:** The impairment in weight and length was more severe in cleft lip + palate and isolated cleft palate children and may be attributed to feeding difficulties compared to the isolated cleft lip group.

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### Resumo

**Objetivo:** Analisar as diferenças no prejuízo do crescimento até os 2 anos de idade, de acordo com o sexo, entre crianças com três tipos de fissuras lábio-palatinas.

**Métodos:** Trata-se de estudo transversal de 881 crianças (58,9% meninos e 41,1% meninas) com fissura lábio-palatina, atendidas no Hospital de Reabilitação de Anomalias Craniofaciais, Universidade de São Paulo, Bauru (SP), com idade entre 1 e 24 meses. Três tipos de fissuras foram avaliados: lábio isolada (181/20,5%), palato isolada (157/17,8%) e lábio+palato (543/61,6%). Foram obtidas medidas de peso e comprimento e informações referentes a aleitamento materno e condições socioeconômicas. Crianças com peso e comprimento abaixo do 10º percentil da referência do NCHS foram consideradas de risco para crescimento prejudicado.

**Resultados:** A distribuição da amostra segundo tipo de fissura e sexo foi semelhante ao observado em outros estudos epidemiológicos. O aleitamento materno foi mais freqüente entre crianças com fissura labial isolada (45,9%) do que nas de fissura palatina isolada (12,1%) ou fissura de lábio+palato (10,5%). Crianças com fissura labial isolada apresentaram menor comprometimento do peso (23,8%) e comprimento (19,3%), quando comparadas ao grupo de fissura de lábio+palato (35,7% e 33,1%, respectivamente), sendo que este apresentou proporções de crianças com peso e comprimento abaixo do 10º percentil muito próximas do grupo de fissura palatina isolada (34,4% e 38,9%).

**Conclusões:** O prejuízo do crescimento é mais grave em crianças com fissura de lábio+palato e fissura palatina isolada e pode ser atribuído principalmente a dificuldades na alimentação, quando comparados ao grupo de fissura labial isolada.

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## Introduction

Clefts of the lip and palate are congenital defects which can be defined based on their manifestations in terms of the discontinuity of structures of the lip, palate, or both, with these lesions occurring at different locations and to a variable extent. One of the most accepted classifications for these lesions<sup>1</sup> uses as reference the anterior incisive foramen, defining three main groups of lesions: incisive preforamen clefts, which may be uni- or bilateral and of variable extension (isolated cleft lip – ICL); incisive postforamen clefts, always found in a median position and varying in extension and width (isolated cleft palate – ICP); and incisive transforamen clefts, leading to a communication between the nasal and oral cavities, with these clefts being uni- or bilateral (cleft lip-palate – CL+P).

Feeding difficulties resulting from the labiopalatine malformation itself or from the inability to take in nutrients during the first months of life, as well as infectious processes in the upper airways or middle ear, are factors causing growth deficiency in children with these malformations. Nevertheless, some investigators who compared the growth of children with different types of clefts did not observe differences between groups, or between these groups and children born without clefts.<sup>2</sup> Other authors have confirmed that children with clefts have a normal genetic growth potential and indicated the importance of the environment in modifying their growth conditions.<sup>3,4</sup>

Studies have emphasized the importance of a precise diagnosis of the type of cleft for growth assessment using populations as homogenous as possible. One can therefore assume that a child with cleft lip-palate, without associated genetic syndromes, will follow a growth pattern that is reflected in one of the percentiles of the reference curve; thus, deviations from this growth trajectory should be taken into account in the same way as done for a child without clefts.<sup>4,5</sup> In contrast, other investigators<sup>6-9</sup> have stated that children with congenital malformations or genetic or clinical syndromes follow their own growth pattern, which might differ from that of normal children, and represent groups with their own “disease-specific” growth pattern. Thus, deviations from these patterns should always be taken into account when assessing a child with a congenital malformation.

Few Brazilian studies are available about the growth of children with cleft lip-palate, and studies on large series are also scarce in the literature. The University of São Paulo Craniofacial Anomaly Rehabilitation Hospital (*Hospital de Reabilitação de Anomalias Craniofaciais da Universidade de São Paulo*, HRAC-USP) is considered to be a reference center for cleft-lip palate in Brazil and has more than 40,000 registered individuals from different Brazilian states. In view of the large number of cases, studies on growth conducted at HRAC-USP could represent the Brazilian reality and provide new definitions about the growth of these children.

The objective of the present study was to analyze the differences in growth impairment up to two years of age according to sex among children with three types of clefts receiving care at the HRAC-USP, Bauru (SP), Brazil.

## Methods

A cross-sectional study was conducted retrospectively on 881 boys and girls aged 1 to 24 months, with different clefts of the lip and palate, seen at the HRAC-USP outpatient clinic during 1 year. Children with clefts associated with genetic syndromes or other congenital malformation were excluded. Only 30 (4.3%) of the 700 children with cleft palate had been submitted to palatoplasty before the study.

Data about age, sex, weight, length, breast-feeding history and socioeconomic conditions collected from the ambulatory care records of HRAC-USP were recorded on a pre-established form.

The following variables were recorded to characterize the study population: sex – determined at the time of physical examination; age – obtained from the birth certificate and approximated to the closest month as described by Gorstein (1990);<sup>10</sup> type of cleft lip and palate – three groups: ICL, CL+P and ICP. To determine the suckling ability of infants with different types of clefts (considering both the nutritive aspect of human milk and the fact that breast-feeding a malformed child is an indication of acceptance on the part of the mother), information was collected about whether the infant had been breast-fed at least during the neonatal period. Also included were infants who, although able to suckle, had also received expressed maternal milk or supplementation with formula.

Socioeconomic categories followed the classification systematized by Graciano *et al.*,<sup>11</sup> which takes into account the number of dependent family members, parental schooling and occupation, family income, housing conditions and location, and presence of basic sanitation. The patients were assigned to one of six socioeconomic levels: lower class, upper lower class, lower middle class, middle class, upper middle class, and upper class.

Weight and length measurements were previously standardized and performed by two trained professionals. The children were measured without clothing in the presence of the accompanying person according to classical criteria.<sup>12</sup> Weight was measured with a baby-type scale with 10-g increment. Length was measured with a horizontal anthropometer with 1-mm increment, with the child in the supine position.

The study was approved by the Ethics Committee at HRAC-USP.

## Statistical analysis

The CDC Anthropometric Software Package (CASP) was used for patient division into groups according to sex, age and type of cleft lip and palate. The percentiles of weight for age and length for age obtained for each child were compared to the National Center for Health Statistics (NCHS)<sup>13</sup> reference percentiles, *i.e.*, the reference used in the institution.

The distribution of the weight and length measurements was compared to values established *a priori* as being inadequate or as indicating growth deviations. Thus, the NCHS reference 10th percentiles<sup>13</sup> of weight/age and length/

age were adopted as cut-off points, as recommended by the Health Ministry of Brazil to separate eutrophic children from undernourished ones,<sup>14</sup> with values below these percentiles indicating deficient weight or deficient length. Considering both sexes and the three cleft types, the frequency of individuals with weight/age and length/age below the 10th percentile (considered as "affected children") was thus determined for the age groups of 1-6, 7-12, 13-18 and 19-24 months.

The chi-square ( $\chi^2$ ) test with a 5% significance level was used to assess the distribution of children according to socioeconomic level, to compare the frequencies of affected infants between sexes and between clefts and also to compare the difference between the frequency of affected infants in the sample and the frequency expected on the basis of the NCHS reference. Fisher's exact test was used to determine the homogeneity of the distribution of affected infants in the various age groups.

## Results

Of the 881 children studied, 181 (20.5%) had ICL: 74 (40.9%) girls and 107 (59.1%) boys; 543 (61.6%) had CL+P: 191 (35.2%) girls and 352 (64.8%) boys; and 157 (17.8%) had ICP: 97 (61.8%) girls and 60 (38.2%) boys.

Breast-feeding was significantly more frequent in the ICL group (45.9%) than in the ICP (12.1%) or CL+P groups (10.5%).

The socioeconomic conditions of the sample under study showed a concentration (81.7%) of individuals in the lower class, upper lower class and lower middle class. There were no significant differences in distribution regarding the three

types of cleft ( $p > 0.10$ ) when considering the sum of the lower, upper lower and lower middle classes in relation to the sum of the other classes.

The distribution of the frequency of children affected in terms of weight and length was homogeneous in the various age groups and for each sex and type of cleft (Table 1). No significant differences were observed between sexes for each type of cleft. In the ICL group, 21.5% of the boys were below the NCHS 10th percentile for weight, as opposed to 27.0% of the girls ( $p = 0.39$ ); the percentages regarding length were 15% and 25.7%, respectively ( $p = 0.07$ ). For the ICP group: weight, 36.7% vs. 33% ( $p = 0.64$ ); length, 33.3% vs. 42.3% ( $p = 0.26$ ). For the CL+P group: weight, 37.2% vs. 33% ( $p = 0.33$ ); length, 35.8% vs. 28.3% ( $p = 0.08$ ).

Overall, 23.8% of ICL children were below the 10th percentile for weight, as opposed to 34.4% and 35.7% of ICP and CL+P children, respectively ( $p = 0.01$ ); for length, the respective percentages were 19.3%, 38.9% and 33.1% ( $p < 0.01$ ). Thus, ICL children were less affected than ICP or CL+P children, with the last two types of cleft presenting similar proportions. The same comparisons were made for each sex separately. All comparisons were significant, except for girl weight ( $p = 0.62$ ).

Comparing the frequency of growth impairment observed in the sample to that expected according to the NCHS reference for each type of cleft and each variable (weight and length) it was shown a significant difference in all cases ( $p < 0.01$ ), indicating that the proportion of affected children in the study population was higher than that expected based on NCHS standards regardless of the type of cleft.

**Table 1 -** Weight and length distribution of children with ICL, ICP and CL+P according to age in months

Cleft	Age	n	Weight*		Length**	
			f < P10	%	f < P10	%
ICL	1-6	85	16	18.8	16	18.8
	7-12	63	19	30.2	10	15.9
	13-18	25	7	28.0	8	32.0
	18-24	8	1	12.5	1	12.5
	Total	181	43	23.8	35	19.3
ICP	1-6	71	25	35.2	36	50.7
	7-12	36	12	33.3	9	25.0
	13-18	17	7	41.2	5	29.4
	18-24	33	10	30.3	11	33.3
	Total	157	54	34.4	61	38.9
CL+P	1-6	213	79	37.1	69	32.4
	7-12	117	38	32.5	45	38.5
	13-18	96	37	38.5	36	37.5
	18-24	117	40	34.2	30	25.6
	Total	543	194	35.7	180	33.1

ICL = isolated cleft lip; ICP = isolated cleft palate; CL+P = cleft lip-palate.  
f < P10 = frequency below the 10th percentile.

\*  $\chi^2$  test for totals:  $p = 0.01$ .

\*\*  $\chi^2$  test for totals:  $p < 0.01$ .

## Discussion

In the present study, impairment in weight and length was observed for both sexes and for all cleft types in each age range comprising the first two years of life, when the 10th percentile was established as cut-off. This impairment was smaller in children with ICL, who also showed a higher frequency of breast-feeding.

The sex and cleft type distributions of the present sample agree with those reported in several epidemiological studies,<sup>15-17</sup> thus indicating that the present sample is representative of children with cleft lip-palate not associated with genetic syndromes. Although not representative of the epidemiology of Brazilian children with clefts, these children might be representative of the epidemiology of this malformation in this age group at HRAC-USP.

In the present study, children with CL+P showed more marked impairment in growth than those with ICL, but similar to that observed for children with ICP, in agreement with other growth studies.<sup>5,18-20</sup> Since these children were in good clinical health at the time of the study, those who did not follow the growth pattern of the group, tending to remain below the cut-off point, should be included in risk groups that need to have their growth monitored more closely.<sup>7</sup>

The use of the 10th percentile as the cut-off point for the definition of impaired growth and nutritional status, especially regarding the weight/age ratio, has been criticized<sup>21</sup> because it presents a high proportion of false-positive results compared to the cut-off point defined as -2 z scores proposed by the World Health Organization.<sup>22</sup> In the present study, the use of the 10th percentile as the cut-off point was based on the premise that this value better represents the situation in which a child shows nutritional and growth alteration before the clear occurrence of impaired growth and malnutrition, in an attempt to determine the deviation early, with the possibility of a rapid intervention, as proposed by Morley in the 1970s.<sup>23</sup> Although this method may have overestimated the number of children with impaired growth in each group, it was a useful tool for identifying children at risk to be included early in a monitoring schedule.

Children with ICL were breast-fed more often than the other two groups, as previously reported.<sup>24-26</sup> Receiving maternal milk becomes important not only in the nutritional context, but also in terms of preventing both respiratory and gastrointestinal infections.<sup>27,28</sup> Thus, children with ICL may show a more satisfactory course of weight and length growth than those with other types of clefts. More marked impairment in growth was observed for boys and girls with ICP and for the CL+P groups, as demonstrated by the higher proportion of children in these groups presenting weight and length below the 10th percentile of the NCHS reference. ICP and CL+P children presented a higher degree of feeding difficulties than ICL children, as demonstrated by the lower frequency of breast-feeding. This greater feeding difficulty, especially during the first days of life, that might lead to the early discontinuation of breast-feeding or even to the fact that these children are never breast-fed,<sup>29</sup> is an important

causal factor in growth deficiency, directly influencing the nutritional status of the child.

Some authors have shown that interventions such as breast-feeding instructions for the mother and palatal obturation can improve the duration of breast-feeding and increase volume intake, promoting a growth of children with clefts during the first two years of life comparable to that of children born without clefts.<sup>30</sup> In addition to feeding support, adequate management of the airways and early surgery in children with clefts were found to significantly reduce the growth deficit, although a greater proportion of children with growth deficits continued to be observed among ICP and CL+P children compared to those with ICL.<sup>31</sup>

Although they presented a better growth performance in relation to the remaining groups, more than one fourth of the children with ICL presented weight and length below the 10th percentile. This result may have been due to the unfavorable socioeconomic conditions of these children, since the sample under study showed a concentration of individuals in the less favored socioeconomic classes.

Although varying degrees of growth impairment, both in terms of weight and length, appeared to have occurred in children with different cleft types, a fact that, in principle, can be attributed to environmental factors (poverty, insufficient food resources, incidence of infectious diseases) and variable degrees of feeding difficulty, the hypothesis cannot be ruled out that growth impairment was associated with other pathologies in some of these children. Unfortunately we do not have information on morbidity in this study. Evidence indicates that psychosocial factors such as parent-infant feeding interactions, infant temperament, social support offered to the mother, and socioeconomic status influence the early growth trajectory of children with clefts, especially during the first three months of life, but subsequent growth is regulated by biological factors.<sup>32</sup> Growth hormone deficiency, which has been studied in children with cleft lip-palate<sup>6,33</sup> and whose effects are already notable during the second or third year of life, requires closer monitoring of these children who are persistently below the lower linear growth percentiles. However, this evidence has been obtained in only a few studies in the literature, which were conducted with a methodology of evaluation of longitudinal growth that differed from that of the present study, and on children of different ages. Thus, there is the need for growth studies on age groups not covered by this investigation, be it cross-sectional studies for the detection of growth-impaired children within the large population attended by our service, or longitudinal studies for a more accurate assessment of the growth patterns of the children attended and for the determination of growth rate.

In conclusion, children born with clefts were more likely to have growth impairment during the first two years of life when compared to the NCHS reference in a large sample of children from a reference hospital, with this impairment being greater among those with ICP and CL+P, a fact mainly attributable to feeding difficulties.

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