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Nutritional status of patients at the moment of primary cleft lip and palate surgery: a retrospective observational study

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Abstract

Objective: This study aimed to analyze the nutritional status of patients with cleft lip and palate at the time of admission and time of performing primary lip and/or palate surgeries at the Hospital for Rehabilitation of Craniofacial Anomalies of Bauru, Universidade São Paulo. Methods: A retrospective observational study was conducted using medical records of individuals with cleft lip and/or palate who underwent primary lip and/or palate surgeries between 2011 and 2021. Anthropometric data were collected upon hospital admission and before primary lip and/or lip surgery. The Z-scores of the growth curves were calculated according to age and sex using the World Health Organization (WHO) Anthro and WHO AnthroPlus programs. Statistical analysis was performed using the Spearman, analysis of variance (ANOVA), and Student's t-tests. Results: Of the 218 participants, 50.46% were men, and most of the patients originated from the southeast region (87.16%) with prevalence of cleft palate (52.75%). A correlation was found between weight/height and weight/age indices with the delay in performing primary lip surgery and height/age with the delay in primary palate and lip surgery (Student's t-test, $p < 0.05$), and no correlation was found between the nutritional/nutrological status and socioeconomic profile (Spearman correlation test, $p < 0.05$) and with the place of origin (ANOVA test, $p < 0.05$). Conclusion: A correlation was found between the weight/height and height/age indices with the delay in performing primary lip surgery and height/age with the delay in primary surgery of the palate and lip.

Keywords: Cleft Lip. Cleft Palate. Nutrition Assessment.

Introduction

Orofacial clefts are the most common congenital anomalies of the craniofacial region and include cleft lip (CL), cleft palate (CP), and cleft lip and palate (CLP) [1]. Its global incidence is 9.92 per 10,000 live births, whereas in Brazil, this rate is estimated at 5.86 per 10,000 births **[2-4]**.

CLP requires multiprofessional and long-lasting treatment. This consists of clinical and surgical interventions and, ideally, extends from the prenatal period (intrauterine diagnosis) to the postnatal period and sometimes reaches adulthood **[5,6]**. The primary surgical approach to the CL and CP (cheiloplasty and palatoplasty, respectively) are responsible for reestablishing basic functions, such as airway permeability, chewing and speech, and for providing adequate tissue growth **[3,7]**. Performing surgery at the recommended time is important for the prognosis and functional and esthetic rehabilitation of the patients **[5,8,9]**, thus constituting an indicator of access to treatment **[4]**.

The American Cleft Palate Craniofacial Association (ACPA) recommends performing cheiloplasty up to age 12 months, whereas palatoplasty up to age 18 months **[10]**. At the Hospital de Reabilitação Craniofacial da Universidade São Paulo (HRACUSP), cheiloplasty is performed between 3 and 6 months of age and palatoplasty between 12 and 18 months of age **[6]**. In Brazil, there is a delay in the primary surgical treatment

of 66.4% for CL and 71.2% for CP **[4]**, and Amstalden-Mendes et al. identified that among aspects of patient health, a low weight gain is the factor having the greatest effect on the decline in the rate of this access indicator **[11,12]**.

However, only a few studies have proven this correlation between patient nutritional status and delay in performing primary lip and palate surgeries. Thus, this study aimed to analyze the nutritional status of patients with CLP at the time of admission and of performing primary lip and/or palate surgeries at HRAC-USP and to verify whether it caused delays in their initial surgical treatment. With the results of this study, support for decision-making is sought to influence the indicator of access to treatment.

Methods

This retrospective observational study was submitted to and approved by the Research Ethics Committee (CEP) of HRAC-USP (Brazil) (Protocol no. 5,017,514), following all the ethical principles of the General Law Research Data Protection.

Inclusion criteria

Data from the medical records of patients with CL and CP who underwent primary lip and/or palate surgeries at HRAC-USP/Bauru, between 2011 and 2021, and who granted permission through the Free Consent Term (clarified for minors <18 or disabled or >18 years old) and/or Term of Free and Clarified Assent for >12 years old, completed in person or by form sent via email at the respective links: https://forms.gle/jdrpbpdogyM3QZas5; and https://forms.gle/x3XeWzZffQK5QJKd9.

After a pre-established period, the waiver of informed consent was granted by the CEP (No. 5,072,398), and participants who did not respond to the survey form were excluded.

Exclusion criteria

The medical records of the participants who refused to take part in the study and did not have the data necessary for the study were excluded.

Collected data and assessment of nutritional/nutrological status

Anthropometric data (such as weight, age, and body mass index) were collected from the medical records of the participants and entered into the World Health Organization (WHO) Anthro (up to age 5 years) and WHO AnthroPlus (>5 years) programs, generating a Z score of the relationships: weight/age (W/A), weight/height (W/H), and height/age (H/A) for participants up to 5 years old and height/age (H/A) and body mass index (BMI)/age (BMI/age) for participants aged >5 years **[13]**. The Z score made it possible to assess the nutritional/nutrological status of the participants, calculated based on the growth curves recommended by the WHO: scores between −3 and 3 points where for W/A between −2 and + 2 points = adequate weight for age, W/A between −2 and +1 points = normal weight; E/I ≥ −2 points = appropriate for age; BMI/age between −2 and +1 points = eutrophy **[14,15]**.

Anthropometric data were collected at three time points: upon admission of the patient to the HRAC-USP, before the primary lip surgery, and/or before the primary palate surgery. The following data were collected and tabulated in the Excel 365 program: origin (city and state), socioeconomic profile, type of cleft, sex, age at admission, age at primary lip surgery and/or age at surgery, primary palate, family income in minimum wages, Human Development Index (HDI) of the municipality, associated disease, use of enteral nutritional therapy, whether intensive treatment was necessary or not, if previously treated in another hospital, and if the CL and CP was associated with the syndrome.

Statistical analysis

To analyze the correlation between the nutritional/nutrological status and the socioeconomic status of the participants, Spearman's nonparametric correlation coefficient was used for nonparametric variables. To compare the place of origin of the participants with the nutritional/nutrological status, analysis of variance (ANOVA) test was performed for variables with normal distribution. To compare the nutritional/nutrological status of the independent groups with and without delay in primary lip and/or palate surgery, Student's t-test was used.

Results

Of the 300 participants who underwent primary lip and/or palate surgery at HRAC-USP/SP between 2011 and 2021, 218 were included for data collection, of which 110 (50.46%) were men and 108 (49.54%) were women. Participants who did not provide informed consent and who did not present data for statistical analysis were excluded.

The prevalence of clefts associated with syndromes was 28.44% (n=62). The distribution of the CL and CP types was as follows: 52.75%, CP (incomplete palate had the highest prevalence);

34.40%, CLP (unilateral CLP had the highest prevalence); and 12.84%, CL (unilateral CL was the most prevalent). The distribution by region of origin was as follows: southeast, 87.16%; central–west, 8.72%; northeast, 1.84%; north, 1.38%; and south, 0.92%. The distribution by state of origin was as follows: 79.36%, São Paulo; 5.51%, Minas Gerais; 4.13%, Goiás; 2.29%, Mato Grosso do Sul; 1.84%, Maranhão, Federal District, and Espírito Santo; 0.92%, Paraná, Rondônia, and Mato Grosso; and 0.46%, Tocantins.

The total delay rate in primary lip surgery was 11.83%, whereas in palate surgery, it was 31.55%.

Participants with isolated CP had a 33.04% delay in primary palatoplasty, and those with CLP had a 29.33% delay in at least one primary surgery (cheiloplasty or palatoplasty); of these, 7 participants had a delay in both cheilopasty and primary palatoplasty (31.81% of the participants with CLP who had a delay in at least one surgery and 0.09% of the total participants with CLP who had a delay in at least one surgery). In participants with isolated CL, there was a delay in 0.07% of primary cheiloplasty.

The mean, standard deviation, median, and interquartile range of the HDI, income in minimum wages, nutritional/nutrological status indices, and time from admission of the participants until the primary lip surgery and/or palate are shown in Table 1.

Table 1. General descriptive statistics.

DATA	MEAN	SD	MEDIAN	QUARTILE 25%	QUARTILE 75%
INCOME (in minimum wages)	3.99	3.92	3.00	1.70	4.90
HDI (OF THE MUNICIPALITY)	0.77	0.05	0.78	0.74	0.80
WEIGHT/AGE - ADMISSION	-1.03	1.44	-1.00	-1.93	0.05
WEIGHT/HEIGHT - ADMISSION	-0.58	1.37	-0.53	-1.48	0.34
HEIGHT/AGE - ADMISSION	-0.90	1.69	-0.65	-1.67	0.07
BMI/AGE - ADMISSION	-0.27	1.43	0.24	-1.43	0.63
AGE ADMISSION (MONTHS)	7.31	14.96	3.00	1.00	6.00
WEIGHT/AGE – PLS	-0.54	1.22	-0.42	-1.14	0.19
WEIGHT/HEIGHT – PLS	-0.22	1.27	-0.12	-1.04	0.48
HEIGHT/AGE – PLS	-0.52	1.32	-0.41	-1.35	0.48
BMI/AGE - PLS	-2.74	--	-2.74	-2.74	-2.74
AGE PERFORMANCE PRIMARY LIP SURGERY (MONTHS)	7.36	9.21	5.00	3.00	7.00
AGE PERFORMANCE PRIMARY PALATE SURGERY (MONTHS)	20.84	17.82	15.00	12.00	21.00
WEIGHT/AGE – PPS	-0.31	1.32	-0.24	-1.00	0.67
WEIGHT/HEIGHT – PPS	0.27	2.41	0.13	-0.85	0.94
HEIGHT/AGE – PPS	-0.66	1.85	-0.47	-1.41	0.31
BMI/AGE - PPS	-0.20	1.06	-0.02	-0.72	0.38
TIME FROM ADMISSION OF THE PARTICIPANTS UNTIL THE PRIMARY LIP SURGERY	2.57	4.39	2.00	0.00	3.00

TIME FROM ADMISSION OF THE PARTICIPANTS UNTIL THE PRIMARY PALATE SURGERY	13.55	11.50	11.37	8.00	15.00

The results of the Spearman correlation test are shown in Table 2, and no correlation was found between the socioeconomic profile and nutritional/nutrological status of the participants ($p<0.05$). Table 3 presents the results of the ANOVA, in which no correlation was found between the nutritional/nutrological status of the participants and their place of origin ($p < 0.05$)

Table 2. Spearman correlation test between the socioeconomic profile and nutritional status of the participant.

	W/A AD	W/H AD	H/A AD	BMI/A AD	W/A PLS	W/H PLS	H/A PLS	W/A PPS	W/H PPS	H/A PPS	
SOCIOECONOMIC PROFILE	-0.08	-0.09	-0.05	0.00	0.00	0.10	-0.17	-0.12	-0.07	-0.10	Correlation Coefficient
	0.216	0.215	0.459	1.000	0.990	0.355	0.111	0.100	0.388	0.161	P Value
	216	208	215	5	93	92	93	185	174	184	Number of Samples

Table 3. Results of the analysis of variance between the nutritional status of the participant and their region of origin.

		Mean	SD	p
WEIGHT/AGE - ADMISSION	Southeast	-.99	1.43	0.485
	North	-1.24	1.04	
	Midwest	-1.28	1.54	
	South	-2.58	.95	
	Northeast	-.57	1.79	
	Total	-1.03	1.44	
WEIGHT/HEIGHT ADMISSION	Southeast	-.59	1.39	0.674
	North	-.67	.62	
	Midwest	-.58	1.35	
	South	-1.22	.35	
	Northeast	.36	.74	
	Total	-.58	1.37	
HEIGHT/AGE - ADMISSION	Southeast	-.82	1.70	0.225
	North	-1.24	1.04	
	Midwest	-1.33	1.56	
	South	-3.25	1.94	
	Northeast	-.98	1.79	
	Total	-.90	1.69	
BMI/AGE - ADMISSION	Southeast	-.57	1.46	0.422
	North			
	Midwest	.94		
	South			
	Northeast			
	Total	-.27	1.43	
WEIGHT/AGE – PLS	Southeast	-.50	1.19	0.514
	North	-1.52		
	Midwest	-.89	1.57	
	South	-1.42		

	Northeast	.45	.13	
	Total	-.54	1.22	
WEIGHT/HEIGHT PLS	Southeast	-.22	1.25	0.856
	North	-1.13		
	Midwest	-.32	1.59	
	South	-.21		
	Northeast	.58	1.17	
	Total	-.22	1.27	
HEIGHT/AGE – PLS	Southeast	-.45	1.30	0.508
	North	-1.05		
	Midwest	-1.08	1.62	
	South	-1.90		
	Northeast	-.03	1.18	
	Total	-.52	1.32	
WEIGHT/AGE – PPS	Southeast	-.28	1.33	0.894
	North	-.17	1.41	
	Midwest	-.48	1.24	
	South	-1.08	1.42	
	Northeast	-.50	1.60	
	Total	-.31	1.32	
WEIGHT/HEIGHT PPS	Southeast	.32	2.55	0.979
	North	.29	1.30	
	Midwest	-.02	1.37	
	South	-.27	1.32	
	Northeast	.04	1.41	
	Total	.27	2.41	
HEIGHT/AGE – PPS	Southeast	-.62	1.94	0.861
	North	-.77	1.34	
	Midwest	-.79	1.22	
	South	-1.82	1.05	
	Northeast	-1.21	1.56	
	Total	-.66	1.85	
BMI/AGE - PPS	Southeast	-.33	1.03	0.277
	North			
	Midwest	.94		
	South			
	Northeast			
	Total	-.20	1.06	

Student's t-test ($p<0.05$) was performed to correlate nutritional/nutrological status with the delay in primary surgeries of participants who had only lip surgery, only palate surgery, and both lip and palate surgery.

The results showed a correlation between W/H ($p=0.043$) and H/A ($p=0.002$) indices at the time of admission with the delay in performing primary lip surgery, H/A on admission ($p = 0.000$), H/A at the time of primary lip surgery ($p = 0.001$), and H/A at the time of primary palate surgery ($p = 0.008$) with the delay in primary lip and palate surgery. Moreover, no correlation was noted with the nutritional/nutrological status and delay in primary palate surgery ($p<0.05$) (Figure 1).

Figure 1. Student's t-test for lip, palate, and lip and palate surgeries.

Test of independent samples – lip surgery

	t-test for Equality of Means						
	t	df	Sig. (2 extremities)	Mean difference	Difference standard error	Confidence Interval of the Difference (95%) Lower	Superior
WEIGHT/AGE ADMISSION	,644	10,850	,533	,46	,72	-1,12	2,05
WEIGHT/HEIGHT ADMISSION	-2,057	89	,043	-,91	,44	-1,79	-,03
HEIGHT/AGE ADMISSION	3,246	90	,002	1,54	,48	,60	2,49
WEIGHT/AGE PLS	,140	10,528	,891	,10	,70	-1,46	1,65
WEIGHT/HEIGHT PLS	-1,072	9,472	,310	-,80	,74	-2,46	,87
HEIGHT/AGE PLS	1,989	10,986	,072	1,19	,60	-,13	2,51

Test of independent samples – palate surgery

	t-test for Equality of Means						
	t	df	Sig. (2 extremities)	Mean difference	Difference standard error	Confidence Interval of the Difference (95%) Lower	Superior
WEIGHT/AGE ADMISSION	-,334	91,255	,739	-,08	,25	-,57	,41
WEIGHT/HEIGHT ADMISSION	-1,511	177	,133	-,33	,22	-,77	,10
HEIGHT/AGE ADMISSION	,872	183	,384	,24	,28	-,31	,79
WEIGHT/AGE PPS	1,047	184	,296	,22	,21	-,19	,63
WEIGHT/HEIGHT PPS	-,273	173	,785	-,11	,41	-,92	,70
HEIGHT/AGE PPS	1,214	183	,226	,36	,29	-,22	,93

Test of independent samples – lip and palate surgery

	t-test for Equality of Means						
	t	df	Sig. (2 extremities)	Mean difference	Difference standard error	Confidence Interval of the Difference (95%) Lower	Superior
WEIGHT/AGE PLS	,484	5,175	,648	0,52	1,06	-2,19	3,22
WEIGHT/HEIGHT ADMISSION	-,720	5,358	,502	-0,68	0,94	-3,04	1,69
HEIGHT/AGE ADMISSION	3,958	50	,000	2,60	0,66	1,28	3,91
WEIGHT/AGE PLS	,484	5,175	,648	0,52	1,06	-2,19	3,22
WEIGHT/HEIGHT PLS	-,464	5,224	,662	-0,51	1,09	-3,28	2,27
HEIGHT/AGE PLS	3,472	51	,001	1,98	0,57	0,84	3,13
WEIGHT/AGE PPS	1,358	5,152	,231	1,75	1,29	-1,54	5,04
WEIGHT/HEIGHT PPS	-,445	4,227	,678	-0,47	1,05	-3,31	2,38
HEIGHT/AGE PPS	2,740	50	,008	1,76	0,64	0,47	3,05

Discussion

This study contributed to the assessment of the nutritional/nutrological status of patients with CLP at the time of admission, primary lip surgery, and primary palate surgery, in addition to correlating it with the delay of these approaches.

Following the recommendations of the WHO **[14,15]**, for the assessment of nutritional/nutrological status, anthropometric data were used to calculate growth curves (indexes), in Z-score, according to sex and age. These scores establish whether or not this assessment is within the normal range. In this study, most of the participants had an adequate nutritional status, in agreement with other reports **[16,17]**.

Regarding gender distribution, a higher prevalence of CLP was reported in men, and there was a greater predominance of clefts that affect the lip and palate **[18-22]**. The results of this study were comparable with those in previous study in relation to sex; however, CP was the most prevalent type. A large part of the sample was characterized by CLP not associated with genetic syndromes, similar to findings in the literature **[23]**.

The ACPA recommends performing primary lip surgery up to age 12 months and up to 18 months for palate surgery **[10]**. A study conducted in the United States showed a greater delay in primary surgeries in individuals with CP than in those with CL, which is similar to the results of the present study. Another study showed that individuals with CLP underwent surgeries even later than those with isolated CP **[24]**. This can be explained by the greater complexity in its approach **[25]**. In the present study, participants with CLP had delays in at least one primary surgery (cheilopasty or palatoplasty), which was exceeded by delays in patients with isolated CP.

This study showed a correlation between the W/H and H/A indices on admission with the delay in primary surgery of patients indicated for lip surgery alone. In patients with indication for lip and palate surgery, a correlation was noted between the delay in primary surgery and H/A index at three points: admission, primary lip surgery, and primary palate surgery. Rudman et al. **[26]** and Laron et al. **[27]** showed that the growth deficiency in the first year of life of children with CLP may be related to the deficiency of growth hormones in these children **[26,27]**, which points to the need for greater scientific attention to the linear growth of this population. Other factors were also identified to influence the development of the height of these children, such as socioeconomic status and social and/or environmental factors **[23]**. No correlation was found in any index with the delay of primary surgery in participants with indication only for palate surgery.

This study, however, did not find a relationship between the nutritional status of individuals and their socioeconomic profile. A possible reason was that most

of the participants in the sample came from municipalities in the southeast region, which resulted in an average HDI of 0.77 and was classified as high. According to Sousa 2021 **[4]**, the lower the municipal HDI, the greater the prevalence of delay in primary lip and palate surgeries, identifying a window in access equity.

Conclusion

In this study, a correlation was found between the W/H and H/A indices on admission of participants with delay in primary lip surgery; H/A on admission in participants with delay in primary lip surgery and primary palate surgery, and nutritional/nutrological status was not correlated with the delay in primary palate surgery. No significant correlation was noted between nutritional/nutrological status and socioeconomic profile and place of origin of the participants. Performing surgery within the time recommended by the ACPA is important to maintain access treatment.

Continuous monitoring of this indicator is important for decision-making by managers and professionals to maintain the quality of care.

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Ethics approval

This retrospective observational study was submitted to and approved by the Research Ethics Committee (CEP) of HRAC-USP (Brazil) (Protocol no. 5,017,514), following all the ethical principles of the General Law Research Data Protection.

Informed consent

The patient signed the consent form.

Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

Similarity check

It was applied by Ithenticate@.

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