THE RELATION BETWEEN CHILD MALNUTRITION AND OROFACIAL ANTHROPOMETRY

Relação entre a desnutrição infantil e a antropometria orofacial

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ABSTRACT

Purposes: to describe the anthropometric orofacial measurements according to age and gender; to compare the average of the left side of the face to the average of the right side of the face, according to age and gender. **Methods:** 27 afro-descending children bearers of malnutrition with ages ranging from 4 to 6 years. **Results:** there was no statistical difference for the anthropometric orofacial measurements according to age and gender. For inferior lip, philtrum and the left side of the face, the measurements presented themselves in a bigger proportion in males. There was no significant difference between the right and the left side, regarding the distance between the external corner of the eye and the cheilion, according to age and gender. **Conclusion:** the age did not represent signification in the results, but there were differences to gender. There were no statistical differences in the comparison of the measurements between the sides of the face for age or gender.

KEYWORDS: Face; Anthropometry; Measures; Child

INTRODUCTION

Children are beings in constant growth and development, processes that depend on several organic, socio-cultural and environmental factors. The proper food is a nutritionally essential aspect for human development. We call the nutritional condition (NC) of the child the process of ingestion, absorption, utilization and excretion of nutrients by the child is called the nutritional condition, which directly reflects in their growth and development. Monitoring growth and development is usually done through charts accompanying the child's body measurements, referred to as growth curves, in order to ensure that the genetic potential for growth is achieved and to minimize the health risks associated with poor nutrition, as for example, obesity and desnutrição[1].

Malnutrition, also referred to as protein-energy malnutrition (PEM), was described this way for the first time in 1920. According to the World Health Organization, it is caused by an imbalance between energy and nutrient supply and the demand necessary for the proper growth and healthy maintenance of organic function[2].

PEM may result in serious consequences for weight-to-height ratio development, make susceptible to infectious diseases, alter the psychomotor balance, and bring out emotional and socialization problems. When it comes to weight-to-height ratio development *deficit* due to malnutrition, it is understood that the bone structure of the affected children may have an altered development [3].

PEM is much widespread in developing countries and one of the forms for its detection is to monitor growth during childhood. To evaluate and monitor this growth we may use anthropometry, the science that studies human body measures for size, weight and proportions[4]. The research in the anthropometry area related to the

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syndromes to craniofacial surgeries, cleft lip and palate, provide important comparative data on the craniofacial growth with respect to the most diverse ethnicities [5-7]. Currently, you can find several anthropometric techniques, from the simplest, such as the manual ones, to the most sophisticated based on teleradiography, cephalometry, 2D and 3D photography [8-10].

The knowledge of anthropometry was adapted to the needs of the speech-Language pathologists, so that they may develop a more objective work, analyzing the orofacial morphology in more details and determine the possibilities for obtaining the functionality of the stomatognathic system. It is known that isolated orofacial anthropometric measurements do not provide specific data for diagnosis, but when used in conjunction with all performed tests, they can become a supplement for clinical assessment, once that they have been proven sensitive and effective to describe craniofacial variations [11,12].

With regard to the benefits of anthropometry in craniofacial assessment, we may mention the simple and easily applicable techniques, without risk and with low cost, and that may be obtained directly from the subject through a caliper, an instrument for measuring the linear distance in millimeters between two points on the same plane or in neighboring planes[5]. The reliability of your measurements depends on the precise location of the anthropometric points, maintaining the head in the proper position and the patient's cooperation. The practice of the practitioner and/or researcher is an essential factor in the quality and accuracy as for the orofacial anthropometric measurements [4,13].

As for the anthropometric orofacial points used in obtaining orofacial measurements, there is, firstly, the glabella (g) which corresponds to the point of the median line between the eyebrows. The trichion (tr) is the point located on the deployment of the hair, in the midline of the forehead. The gnathion (gn) is the lowest midpoint at the low canthus of the jaw. The outer canthus of the eye (ex) is located at the lateral commissure of the eyelid and is located medial to the outer canthus of the eye of the hard tissue. The subnasal (sn) is the midpoint at the angle on the base of the columella, where the lower canthus of the nasal septum and the surface of the upper lip meet. The upper lip point (ls) is the midpoint located at the line of the upper lip redness. The stoma (sto) is the imaginary point located at the crossing between the median vertical line of the face, that connects the trichion (tr), the subnasal (sn) and the gnatio (gn) and the horizontal line of the *rima oris*, when the lips is lightly closed and the teeth occluded, with the head in the natural position. The cheilion (ch) corresponds to the point located at the lips comissure [5,11,13,14].

As for the factors regarding growth, the inheritance, including ethnic origin, the environment properly said and the diet are reporting agents that are not to be ignored [1,6,7]. The interest for accomplishing this research emerged while we verified studies shortage on the orofacial measurements and proportions in children with PEM.

The specific objectives of this study were: 1. describe anthropometric orofacial measurements according to age and gender; 2. compare the average of the left side of the face to the average of the right side of the face, according to age and gender.

METHODS

This research was reviewed by the Ethics and Research Committee (CER) for Post-graduation in Health and Education – requiring the Term of Informed Consent.

It has a transversal nature, attended by 27 children, age varying from four to six year old, 66% female and 34% male, mean age 4.8 years. Children were divided into three groups according to age, namely: 11 (40%) subjects 4 year old, 8 (30%) subject 5 year old and 8 (30%) subjects 6 year old. All were treated at the Center for Nutritional Recovery and Education in São Paulo (CREN). The persons in charge for each child authorized the research by signing the consent form.

Inclusion criteria for children in this study were: a) being a PEM bearer diagnosed by the professionals from the Nutrition Area of CREN; and b) be African descent. Exclusion criteria for the children were: a) history of prior and/or current speech-language therapy; b) historical of a syndrome and/or neurological disease and/or bifid uvula; e c) history of craniofacial malformations.

Data collection, based on the protocol proposed by Cattoni[5], consisted of anthropometric orofacial measurements of each subject individually, considering the following references: upper lip height (sn – sto); lower lip height (sto – gn); philtrum height (sn – ls); upper face third height (tr – g); midface third height (g – sn); lower face third height (sn – gn); distance between the outer canthus and the cheilion on the right side of the face (ex – ch); distance between the outer canthus and the cheilion on the left side of the face (ex – ch); During collection, the child was asked to remain seated with his/her feet flat on the floor, with his head in a resting position and with the lips closed. The anthropometric points were marked on the face of each child with an eye pencil for their correct location. The measurements were

taken twice each (Measure I and Measure II), and is considered the arithmetic average of each anthropometric measure. The anthropometric orofacial measurements were obtained without pressing the caliper's tips against the skin surface. As ludic resources were we used different cardboard masks with children themes, distributed individually after the measurement. The justification with children for the collaboration with the research was the need to get the exact measurements for indicating the correct mask. All above-mentioned procedures were performed at the Center for Nutritional Recovery and Education. Upon completing the assessment of each child, the caliper's stems were washed and disinfected with ethylic hydrated alcohol, by rubbing with cotton. The procedures with each child lasted approximately 20 minutes.

To obtain anthropometric orofacial measurements were used: surgical glove, cotton, ethylic hydrated alcohol, detergent and LEE 6" digital caliper, with 0.02mm (millimeters)/+or-0.001" precision 0.01mm/0.0005" resolution and 0.01mm/0.0005" repetition, Chinese manufacturing.

In order to describe the anthropometric orofacial measurements of the studied group, data were compiled in a descriptive way. To obtain comparative analysis, data were subjected to statistical analysis, which adopted a significance level of 5% (0.050) for applying the statistical tests (Kolmogorov-Smirnov Test, Analysis of Variance, *Student* t test). We used SPSS (*Statistical Package for Social Sciences*), release 13.0, in order to obtain the results.

RESULTS

Table 1 shows the results regarding the study for the variables at issue. As all calculated significances (p) are values larger than the adopted significance it may be said that all the variables have normal distribution.

In Table 2, there were differences among the three age groups, when compared concurrently. We noted, for all concerning variables, that the differences among the three ages are not statistically significant.

Table 1 – Study of normality for the variables of interest

Variable	n	Mean (mm)	Standard deviation	Significance (p)
Upper lip (sn-sto)	27	19.01	2.33	0.920
Lower lip (sto-gn)	27	32.19	2.57	0.724
Philtrum (sn-ls)	27	12.21	1.62	0.961
Upper third (tr-g)	27	54.36	5.62	0.946
Middle third (g-sn)	27	47.48	3.69	0.981
Lower third (sn-gn)	27	51.02	3.42	0.643
Right side of the face (ex-ch)	27	58.62	2.56	0.824
Left side of the face (ex-ch)	27	58.21	2.92	0.574

Legend: n = No. of subjects; mm= millimeters; p = significance.
Test used: Kolmogorov-Smirnov Test

Table 2 – Comparison of orofacial measurements according to age

Variable	Age	n	Mean (mm)	Standard deviation	Confidence Interval (mm)		Significance (p)
					Lower Limit	Upper Limit	
Upper lip (sn-sto)	4	11	20.05	1.76	18.87	21.23	0.149
	5	8	18.09	2.84	15.72	20.46	
	6	8	18.51	2.19	16.68	20.34	
	Total	27	19.01	2.33	18.09	19.94	
Lower lip (sto-gn)	4	11	32.75	3.08	30.68	34.82	0.601
	5	8	31.52	1.89	29.94	33.10	
	6	8	32.07	2.53	29.96	34.19	
	Total	27	32.19	2.57	31.17	33.20	
Philtrum (sn-ls)	4	11	12.36	1.54	11.32	13.39	0.903
	5	8	12.01	1.95	10.37	13.64	
	6	8	12.21	1.56	10.91	13.51	
	Total	27	12.21	1.62	11.57	12.85	
Upper third (tr-g)	4	11	52.05	3.46	49.72	54.37	0.117
	5	8	54.48	6.66	48.91	60.04	
	6	8	57.43	6.06	52.36	62.49	
	Total	27	54.36	5.62	52.14	56.58	
Middle third (g-sn)	4	11	46.85	3.50	44.50	49.20	0.313
	5	8	49.17	2.86	46.78	51.56	
	6	8	46.65	4.49	42.90	50.40	
	Total	27	47.48	3.69	46.02	48.94	
Lower third (sn-gn)	4	11	51.76	3.96	49.10	54.42	0.660
	5	8	50.58	3.12	47.98	53.19	
	6	8	50.43	3.13	47.82	53.05	
	Total	27	51.02	3.42	49.67	52.37	
Right side of the face (ex-ch)	4	11	58.44	2.45	56.80	60.09	0.958
	5	8	58.77	2.31	56.84	60.70	
	6	8	58.72	3.22	56.03	61.42	
	Total	27	58.62	2.56	57.61	59.64	
Left side of the face (ex-ch)	4	11	57.86	2.83	55.95	59.76	0.744
	5	8	58.89	3.15	56.25	61.53	
	6	8	58.01	3.08	55.43	60.59	
	Total	27	58.21	2.92	57.05	59.36	

Legend: n = No. of subjects/ mm= millimeters; p = significance.
Test used: Univariate Variance Analysis

Table 3 checked the comparison of the orofacial anthropometric measurements according to gender. Some measurements were statistically similar. Although the *Student* t test has indicated nearly totality for similarities between the genders, we noted statistically significant differences for measurements of lower lip (sto-gn), philtrum (sn-ls) and the left side of the face (ex-ch) showing higher values in males.

Table 4 shows the comparison of both sides of the face according to gender and age. It is noted that in all studied cases, the differences were non-statistically significant, indicating that the sides of the face were similar throughout the sample, averaging about 58mm.

Table 3 – Comparison of orofacial measurements according to gender

Variable	Gender	n	Mean (mm)	Standard deviation	Significance
Upper lip (sn-sto)	Female	18	18.56	2.48	0.153
	Male	9	19.93	1.80	
Lower lip (sto-gn)	Female	18	31.41	2.31	0.023
	Male	9	33.75	2.45	
Philtrum (sn-ls)	Female	18	11.74	1.49	0.030
	Male	9	13.15	1.51	
Upper third (tr-g)	Female	18	55.24	6.25	0.187
	Male	9	52.60	3.79	
Middle third (g-sn)	Female	18	46.87	3.84	0.228
	Male	9	48.71	3.21	
Lower third (sn-gn)	Female	18	50.26	3.36	0.104
	Male	9	52.54	3.16	
Right side of the face (ex-ch)	Female	18	58.02	2.60	0.080
	Male	9	59.84	2.11	
Left side of the face (ex-ch)	Female	18	57.45	3.11	0.024
	Male	9	59.73	1.80	

Legend: n = No. of subjects; mm= millimeters; p = significance.
Test used: *Student t, controlled by Levene test for Equal Variances*

Table 4 – Comparison of both sides of the face according to gender and age

Gender / Age	Pair of Variables	Mean	n	Standard deviation	Significance
General	Right side of the face (ex-ch)	58.62	27	2.56	0.363
	Left side of the face (ex-ch)	58.21	27	2.92	
Female	Right side of the face (ex-ch)	58.02	18	2.60	0.296
	Left side of the face (ex-ch)	57.45	18	3.11	
Male	Right side of the face (ex-ch)	59.84	9	2.11	0.899
	Left side of the face (ex-ch)	59.73	9	1.80	
Age 4 years	Right side of the face (ex-ch)	58.44	11	2.45	0.485
	Left side of the face (ex-ch)	57.86	11	2.83	
Age 5 years	Right side of the face (ex-ch)	58.77	8	2.31	0.891
	Left side of the face (ex-ch)	58.89	8	3.15	
Age 6 years	Right side of the face (ex-ch)	58.72	8	3.22	0.350
	Left side of the face (ex-ch)	58.01	8	3.08	

Test used: *Student t test for paired data*

DISCUSSION

We decided for applying the methodology described in classic anthropometric study with regard to the used instrument, as well as data collection procedure. The criteria regarding the positioning of the subject and the examiner during data collection and position of head and lips were respected [4].

During data collection, one can realize that despite the young age and socioeconomic condition, all children understood the orders necessary for safely conducting the anthropometric orofacial measurements. It was found that there was no significant difference for the measures when considering the comparison between the assessed ages.

The study included only African-descent children because, differences in anthropometric measurements are demonstrated in researches with populations composed of different races [4,6,7]. Other aspects such as ethnicity and geographic variation are also important factors that may interfere with facial growth [6]. In this study, we selected only African-descent children, because we noted lack of literature and anthropometric orofacial researches with non-leukoderm populations in the 4 to 6 year age group and it is believed that the data herein collected through validated protocols may be vary valuable for comparative studies among the ethnic groups in this age group.

When performing the statistical analysis for the measurements, comparing genders, there was a significant difference for the lower lip (sto-gn), philtrum (sn-ls) and the left side of the face (ex-ch). In males, the measurements of these three structures are always present in greater proportion. In the comparison between the thirds of the face, upper lip (sn-sto) and outer canthus of the eye to the right cheilion (ex-ch), there were no statistically significant differences.

In measurements relative to the distance from the outer canthus of the eye to the cheilion on the right side (ex-ch) there was not noted any significant difference when compared to measures the distance from the outer canthus of the eye to the cheilion on the left side (ex-ch), considering the variables age and gender. Enlow and Hans [15,] in their study on facial growth, mention the more pronounced trend for growth of the male body in relation to the female body. In some variants of this research, there are significant differences between the genders, as for the lower lip (sto-gn), philtrum (sn-ls) and the left side of the face (ex-ch), higher in males. Considering the facial growth, Enlow and Hans [15] report that facial structures such as the external layer of the frontal bone, continue to grow for years in males after stabilization in females that occurs around 5 or 6 year old, which may explain some major differences in facial growth among genders [15].

This work has its limitations to the effect of studying a specific population and also for having a relatively narrow sample, but homogeneous, because numerous criteria are settled for inclusion and exclusion, and it should be a step for future investigations that may shed light on the relationships among the noted results. It is equally important to compare the orofacial measurements of children in this sample with the measurements available in the literature for non-bearing PEM children, as well as to consider the facial type, as carried out on recent researches with different populations [16-22].

In short, according to the specific objectives of the research, it can be seen that the age of the analyzed subjects did not represent an important significance in the statistical findings. However, when considering the gender factor, statistical differences were effectively found. In comparing the measurements between the sides of the face (ex-ch), no significant differences were noted for both the gender variable, as well as for the age variable.

CONCLUSION

Age showed no significance in the findings, but there were differences for the gender factor, where differences were statistically significant for lower lip (sto-gn), philtrum (sn-ls) and left side of the face (ex-ch), always with higher proportion in males. There were no statistical differences in the measurements between the sides of the face for age and sex.

RESUMO

Objetivos: descrever medidas antropométricas orofaciais segundo a idade e o sexo; comparar a média do lado esquerdo da face com a média do lado direito da face, segundo a idade e o sexo. **Métodos:** 27 crianças afro-descendentes portadoras de desnutrição com idade entre 4 e 6 anos. **Resultados:** não houve diferença estatística para as medidas antropométricas orofaciais segundo idade e sexo. Para lábio inferior, filtro e o lado esquerdo da face, as medidas apresentaram-se em proporção maior no sexo masculino. Não foi constatada diferença significante entre o lado direito e o lado esquerdo no que se refere à distância do canto externo do olho ao *cheilion*, segundo idade e sexo. **Conclusão:** a idade não representou significância nos achados, mas ocorreram diferenças para o fator sexo. Não há diferenças estatísticas na comparação das medidas entre os lados da face para idade ou sexo.

DESCRITORES: Face; Antropometria; Medidas; Criança

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