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Orofacial anthropometric measures in full-term newborns

Medidas antropométricas orofaciais em recém-nascidos a termo

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Keywords

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ABSTRACT

Purpose: To describe and compare the anthropometric measurements and the orofacial proportions of healthy term newborns (NB) according to sex, from a public maternity hospital in the state of Sergipe, northeastern Brazil. **Methods:** Descriptive and analytical randomized study was carried out. The participants included were 46 randomly selected healthy and full-term RNs of both sexes. A digital caliper was used to measure measurements (in millimeters) with the NB supine and occluded lips. Twice different, previously trained researchers measured each NB. Data were described using simple and percentage frequencies. The mean differences were assessed using the Mann-Whitney test, with a significance of 5%. Associations evaluated by the Fisher Exact test, and Cohen D size effects were calculated. **Results:** Differences were found between the groups for the anthropometric measurements: midface third height (glabella-subnasal or sn-g) and bottom (subnasal-gnathion or sn-gn); and filter heights (upper-lip subnasal or sn-ls), the upper lips (subnasal-estomus or sn-sto), and lower (stomatal-gnathion or sto-gn), which was always greater in males. The orofacial proportions studied did not show differences between sexes. **Conclusion:** The study showed the presence of sexual dimorphism for the measures of the face at birth in the population born in Aracaju, Sergipe.

Descritores

Face
Antropometria
Pesos e Medidas Corporais
Recém-nascido
Neonatologia

RESUMO

Objetivo: Descrever e comparar as medidas antropométricas e as proporções orofaciais de recém-nascidos (RNs) a termo saudáveis, segundo o sexo, de uma maternidade pública do estado de Sergipe, Nordeste do Brasil. **Método:** Estudo randomizado descritivo e analítico. Participaram 46 RNs a termo e saudáveis, de ambos os sexos, selecionados aleatoriamente. Foi utilizado paquímetro digital para tomadas das medidas (em milímetros), com os RNs em posição supina e lábios ocluídos. Quatro pesquisadores foram previamente treinados, com cada RN sendo medido duas vezes por uma mesma dupla destes. Os dados foram descritos por meio de frequências simples e percentuais. As diferenças de média foram avaliadas através do Teste de Mann-Whitney, com significância de 5%. Associações foram avaliadas através do teste Exato de Fisher. Foram calculados tamanhos de efeitos D de Cohen. **Resultados:** Foram obtidas diferenças entre os grupos para as medidas antropométricas: terços da face médio (glabela-subnasal ou g-sn) e inferior (subnasal-gnátio ou sn-gn); e alturas do filtro (subnasal-labial superior ou sn-ls), dos lábios superior (subnasal-estômio ou sn-sto) e inferior (estômio-gnátio ou sto-gn), sempre maiores no sexo masculino. As proporções orofaciais estudadas não apresentaram diferenças entre sexos. **Conclusão:** O estudo apontou presença de disformismo sexual para as medidas da face ao nascimento na população nascida em Aracaju, Sergipe.

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INTRODUCTION

Anthropometry has the measures of size, weight, and proportions of the human body as its study object[1-4]. Measurement of craniofacial structures, especially in the first days of life, is an important complementary data on neonatal health status[5-8], its results have already been used in pediatrics, otorhinolaryngology, orofacial surgery, and syndromes[9-12].

Although the cranium anthropometric study is widely used in the neonatal medical clinic, including the regional pattern influenced by the various ethnic groups[13], facial anthropometric measurements and their proportions[1,14-17] are still used shyly by health professionals, in particular by the speech therapist working in the field of Orofacial Motricity.

Anthropometry adds objectivity to assessment and provides data for differential and complementary diagnosis of changes, therapeutic planning, and prognostic visualization[14,15,18,19]. Measurement of craniofacial measurements can be done by direct anthropometry (use of calipers and / or tape on the patient's face) or indirect (cephalometric measurements or photographs)[2,4,20,21].

In general, the works[9,22] focus on the anthropometry of the newborn's cranium (NB). One of the highlights is a study[13] performed in the Northeast region of Brazil, which obtained head circumference, biauricular and anteroposterior distance measurements, cephalic index and fontanelle measurements of 450 NB at term.

Regarding orofacial measurements and proportions, the study of different populations has been justified by the great variability, according to age, geographic, sex[3] and race[1,9,14,23], focusing on the adolescent population[2] and adult[3,23,24]. Specifically in Brazil, there are studies in different groups, such as: healthy children[1]; children[15] and adults[25] with mouth breathing syndrome; Japanese-Brazilian population[14]; young people from the state of Rio de Janeiro[2]; and children with malnutrition[18].

However, we highlight the gap in studies addressing healthy NBs, which could bring knowledge about orofacial morphology in this population, as it is known that orofacial functions are intrinsically related to this aspect of the stomatognathic system[1-4]. Thus, we highlight the importance of the speech therapist to have references of orofacial anthropometric measurements and proportions in NBs, aiming at the objective and detailed evaluation of the orofacial morphology and monitoring the orofacial motricity of this population.

This study aimed to describe and compare the anthropometric measurements and orofacial proportions of NBs healthy term, according to sex in a public hospital in the state of Sergipe, northeastern Brazil.

METHODS

A descriptive and analytical randomized study conducted in a public maternity hospital in the city of Aracaju (SE), which established, based on gestational age and sex, the orofacial measurements of healthy NBs. The Research Ethics Committee (REC) of Universidade Federal de Sergipe approved it under nº CAAE 53611316.0.0000.5546.

The study included 46 NBs who were admitted to the maternity hospital between August 2016 and February 2017. The study involved minimal risk to participants, related to possible embarrassment. All participants' guardians signed a free and informed consent form.

Inclusion criteria were: full-term NBs, appropriate for gestational age (AGA) according to physical examination, clinically stable and admitted to the maternity hospital in which the study was conducted. Exclusion criteria were: the presence of craniofacial anomalies, severe complications at birth (APGAR within 1 min <5 and 5 min <7) and has been alternatively orally fed (nasogastric tube and / or orogastric tube).

In the maternity accommodation, the daily census of the sector was observed and the NBs who were eligible for the study were randomly selected from the draw (meeting the inclusion and exclusion criteria).

Soon after collecting the authorizations by the guardians, hand washing procedures by the researchers, and having the hands put on latex gloves, the orofacial anthropometric measurements of the NBs were taken, being preferably in sleep, positioned in the cradle or bed, in a position supine, with lips occluded.

The measurement procedure was performed by four researchers previously trained by the author[26] of the Data Collection Protocol. The measurements, which were taken in millimeters (mm), had their arithmetic mean calculated for each measured structure. All of them were transcribed in the adapted protocol, whose header was expanded to the neonatal population, and the item "other orofacial measures" was excluded (Annex 1).

The orofacial points were marked with Make B® black eye pencil. After the procedure, the markings were removed with water-moistened soft cotton.

A stainless steel Stainless Hardened® digital caliper was used, with a liquid crystal display and unit system indication in mm, with a resolution of 0.01mm and an accuracy of +/- 0.03 mm / 0.001mm. The tip of the instrument was coated with adhesive as a safety, not to hurt the NB. Once this was done, the caliper was reset, ensuring the initial reference point for the measurements, eliminating any interference with the use of the adhesive.

The procedure for obtaining the measurements was performed twice with each NB, by the same observer, with the help of a second researcher to contain the head and avoid risks to the NB. After each procedure, the caliper was sanitized with 70º INPM hydrated ethyl alcohol and cotton, rubbing five times on the instrument stems.

Considering the nature of the subject (neonate), there was a potential risk of waking him or the sudden movement that would cause injury if there was too much manipulation in the procedure of taking measures. Thus, each subject was measured only twice. Due to these limitations, inherent to the characteristics of the studied population, no measures were discarded.

However, due to the absence of thresholds in the literature for a technical error of measurement in orofacial measurements, we chose to use the Bland-Altman graph[27] to evaluate possible discrepancies. However, it was observed that of the analyzed variables, the discards were justified on 1 or 2 occasions in each variable, resulting in at least 95.6% of the observations with reliability.

The points that served as reference for the anthropometric measurements are represented in Figure 1, they are: *trichion* (tr), which is the point located at the insertion of the hair in the midline of the forehead (in NB without hair, the tr was considered as a point corresponding to what would be the insertion of the hair in the midline of the forehead); the glabella (g), which is the most prominent point on the midline between the eyebrows; the subnasale (sn), which is situated medially in the meeting of the inferior border of the nasal septum with the surface of the superior lip; the upper lip (labiale superius – ls), which is located medially at the redness line of the upper lip; the stomion (sto), which is an imaginary point situated in the medial region of the intercession between the median vertical line of the face and the horizontal line of the mouth rhyme, when the lips are closed and the teeth are occluded; the gnathion (gn), which is the point located in the lower region of the lower jaw edge; the outer corner of the eye (exocanthion – ex), which is medially situated on the outer edge of the eye, with reference to the hard tissue; e the cheilion (ch), which is the point located on the lip commissure[1,14-17] (Figure 1).

The following anthropometric measurements were taken: upper third of the face (tr-g); middle third of face (g-sn); lower third of face (sn-gn); distance between the outer corner of the eye and the cheilion (ex-ch) right and left; filter height (sn-ls); upper lip height (sn-sto) and lower lip height (sto-gn)[17] (Figure 2).

After the measurements were taken, the orofacial proportions were calculated: upper lip divided by lower lip (sn-sto / sto-gn); upper third divided by lower third (tr-g / g-sn); and middle third divided by the lower third (g-sn / sn-gn)[17].

The collected data were tabulated in a Microsoft Excel 2016® spreadsheet and treated with a significance level of 5% (p<0,05).

Data were described using simple frequencies and percentages when categorical, as well as mean and standard deviation when continuous. Mean differences were assessed using the Mann-Whitney test, and associations using Fisher's exact test. Agreement between measurements was calculated by Pearson correlation.

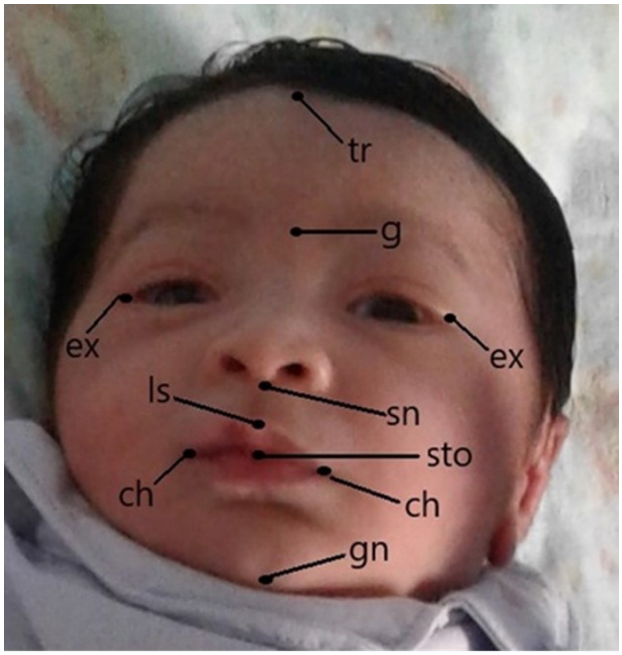
Due to the availability of data, all significance was accurately evaluated. Cohen D effect sizes were calculated and interpreted as proposed by Sawilowsky[28]: Very small (0.01), small (0.20), medium (0.50), large (0.80), very large (1.20) and huge (2.0).

RESULTS

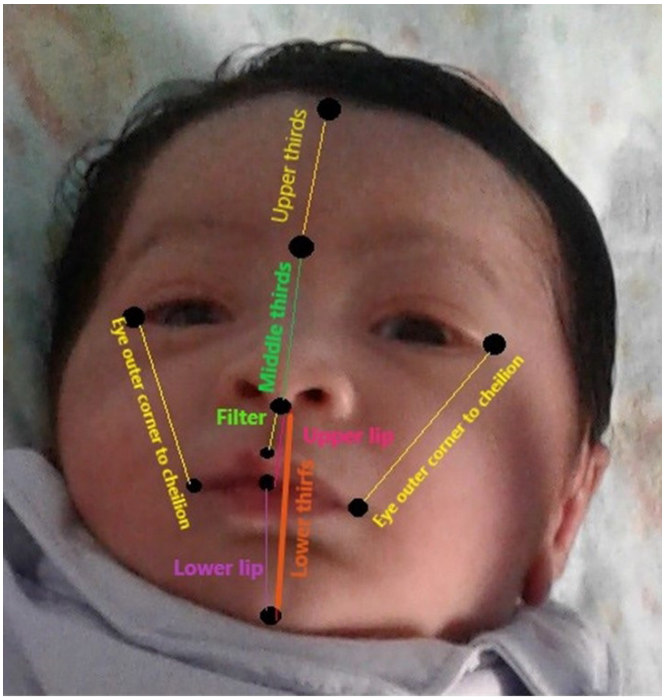
The results of this study are presented in Table 1. In all participants, regarding gestational age at birth (GAB), there was no difference between groups, ranging from 36,43 weeks to 42,57 weeks, studied NBs mean age o was 39.24 (SD: 1.51) weeks.

Concerning the agreement between the measures, Pearson's correlation. Correlations were significant for all facial measurements and greater than 0.8 for upper third (tr-g) (0.863), middle third (g-sn) (0.821), lower third (sn-gn) (0.833), right outer corner (ex-ch) (0.800), upper lip (sn-sto) (0.813) and lower lip (sto-gn) (0.820). The filter (sn-ls) obtained agreement of 0.727, and the left outer corner (ex-ch) 0.549.

Regarding the average of facial measurements, differences were found for the middle and lower thirds of the face, with higher values in males. There were also differences in the mean upper, lower lip and filter measurements, again higher in males. All observed differences were classified between small and medium magnitude, according to Cohen's criterion.



Captions: tr = trichion; g = glabella; sn = subnasale; ls = labiale superius; sto = stomiom; ch = cheilion; gn = gnathion; ex = exocanthion
Source: Researcher's archive
Figure 1. Orofacial Anthropometric Points



Source: Researcher's archive
Figure 2. Orofacial anthropometric measurements

Table 1. Mean gestational age, orofacial anthropometric measurements and proportions in newborns, matched for age and sex. Aracaju, 2017

	General Mean (SD)	Sex		p-value	D
		Female Mean (SD)	Male Mean (SD)		
GAB (weeks)		38.84 (1.33)	39.55 (1.59)	0.086	-0.245
Upper third (mm)	30.37 (4.46)	30.13 (4.45)	30.55 (4.56)	0.818	-0.046
Medium third (mm)	28.17 (2.60)	27.26 (1.72)	28.87 (2.96)	**0.030**	-0.362
Lower third (mm)	32.24 (3.50)	30.92 (3.25)	33.26 (3.40)	**0.039**	-0.355
Outer corner of right eye (mm)	35.91 (2.46)	35.48 (1.96)	36.25 (2.78)	0.438	-0.160
Outer corner of left eye (mm)	35.69 (2.36)	35.30 (2.34)	36.00 (2.38)	0.406	-0.151
Upper lip (mm)	11.96 (1.58)	11.23 (1.33)	12.52 (1.55)	**0.007**	-0.449
Lower lip (mm)	21.34 (3.30)	20.32 (3.66)	22.12 (2.83)	**0.013**	-0.285
Filter (mm)	8.26 (1.10)	7.83 (0.77)	8.60 (1.21)	**0.007**	-0.404
Upper lip / Lower lip	0.56	0.56 (0.08)	0.57 (0.08)	0.706	-0.065
Upper third / Medium third	1.07	1.11 (0.17)	1.06 (0.13)	0.240	0.166
Medium third / Lower third	0.87	0.89 (0.09)	0.87 (0.08)	0.520	0.101

Captions: GAB – gestational age at birth; mm – millimeter; SD – standard-deviation; D – Cohen's size effect; Mann-Whitney test

Other measures, including proportions, did not show significant differences between sexes (Table 1).

Regarding the general values found for the orofacial proportions, namely upper lip and lower lip (sn-sto / sto-gn), upper third and middle third (tr-g / g-sn) and middle third and lower third (g-sn / sn-gn), there were no differences between the groups (Table 1).

DISCUSSION

The study of anthropometry in Orofacial Motricity, with the establishment of reference values for several populations, besides bringing advantages to the evaluation, facilitates interdisciplinary communication, since the speech therapist can base his evidence and demonstrate it to other professionals from of objective data[17].

This research is a pioneer in investigating orofacial measurements and proportions in NBs born in the Northeast region of Brazil. The study showed that it is possible to perform an objective and quantitative facial morphological evaluation in NBs, using parameters from head restraint, preferably during supine sleep behavior, paying attention to safety in the use of caliper.

Since changes in facial morphology impact orofacial functions[1-4], It highlights the applicability of the evaluation of measures and anthropometric orofacial proportions at an early age (along with NBs). Conducting research in this area, as the present study aims to add knowledge of orofacial measures in the study population, establishing benchmarks so that you can evaluate possible variables that compromise the development and maturation of orofacial functions.

In view of the objective assessment of facial morphology in NBs proposed here, it is believed that, with early intervention, it will be possible to minimize any morphological interference in orofacial functions, seeking to ensure their proper development in NBs.

The present study showed that in the early period of life, in term and healthy NBs, there are sex differences for some orofacial anthropometric measurements, coinciding with the pattern described in the literature[14,22] on average measurements, always higher in males.

On the adult's face, the literature[29] It has as reference values a height of the upper lip with an average of 19 to 22 mm and a lower lip of 38 to 44 mm, with higher values in males. The present study also corroborates this relationship between NBs, with higher values in males, conferring sexual dimorphism in the population studied for some collected measures.

The results of the present study also meet research that indicates that there are statistical differences in orofacial anthropometric measurements between sexes, but these differences were not found between orofacial proportions[1,15]. Future studies are needed to better understand these variables in the study population, clarifying the clinical impact of these findings.

In neonate population, a study[30] in northern India, the values of 8.85 mm for the NB's filter and 7.75 mm for females were observed, with an average of 8.30 mm, very similar to that found in the population studied here (8.26 mm).

However, the lack of specific studies of orofacial anthropometric measurements in the NB population made it difficult to compare the findings of this study with other studies involving this age group. As a limitation of the present study, inherent to the characteristics of the population, there was, for example, the lack of NB hair, leading to the need to assume about the location of the trichion (tr), which may compromise the accuracy of the data.

Another limitation was the impossibility of multiple measurements of the NB's facial measurements when there was a discrepancy between values, which led to the non-discarding of measurements with a relative agreement, such as the left eye corner. On the other hand, all significant results between the groups referred to measures and proportions that obtained high agreement.

This research contributed to the characterization of anthropometric measurements and orofacial proportions in healthy NBs of a maternity hospital in the state of Sergipe. Given

the regional variability, these values cannot be generalized to NBs from other regions, being essential to expand the study in different states.

CONCLUSION

The study established the orofacial measurements and proportions in healthy NBs of maternity in the state of Sergipe, showing the differences between the sexes at birth, always larger in males.

In general, it is possible to point out the presence of sexual dimorphism for the measures of the face at birth, while there is no evidence of this finding when it comes to the orofacial proportions in the studied population.

Due to regional variation, it is necessary to expand the study with populations from other locations, through a multicenter study, to create an anthropometric profile of the Brazilian NBs.

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Author contributions

AMCM was responsible for study design, data analysis and interpretation, article review and final approval of the version to be published; VNS, KCFS, ARSS, BRSS, FBS were responsible for the collection, writing of the article; TPLS was responsible for writing and final revision of the article; ÍDCB was responsible for the statistical treatment, analysis, interpretation of manuscript data and English version of the manuscript; DMC was responsible for the training of researchers, analysis and review of the article; RQG participated in the discussion for the structuring of the research and was responsible for the analysis and review of the article. All authors read and approved the final wording of the paper.

Annex 1. Data Collection Protocol

Room: ____ Bed: ____ Nº: ___

1. Identification Data:

Mother's Name: _____ Idade da mãe: _____

Profession: _____ No. of pregnancies: ___ Abortions: ___ Parity: ___

NB's name: _____ Sex: M ___F___

Date of birth: ___/___/201___ GAB: ___ DL: __ CGA: ___

Cephalic perimeter: _____

2. Orofacial Anthropometric Measurements:

Region	Structure	Measure I (in mm)	Measure II (in mm)	Average (in mm)
Facial	Upper third (tr-g)			
	Medium third (g-sn)			
	Lower third (sn-gn)			
	Outer corner of the right eye to *cheilion* (ex-ch)			
	Outer corner of the left eye to *cheilion* (ex-ch)			
Nasolabial	Upper lip (sn-sto)			
	Lower lip (sto-gn)			
	Filter (sn-ls)			

3. Orofacial Proportions:

Upper lip Lower lip	
Upper third Medium third	
Medium third Lower third	

Source: Adapted from Cattoni[26]