Orofacial characteristics of functionally independent elders

Características orofaciais de idosos funcionalmente independentes

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ABSTRACT

Purpose: to understand the main orofacial characteristics of functionally independent elderly individuals and to investigate their association with age, gender, socioeconomic level, and dental status. **Methods:** an observational, cross-sectional, and analytical study was carried out with a non-probabilistic sample. Inclusion criteria: minimum age of 60 years, individual in good health conditions according to a pre-established protocol published by the health care service. In order to collect the data, we used the validated Orofacial Myofunctional Evaluation with Scores for Aged Protocol. **Results:** The elderly individuals presented normal patterns in more than 60% of the appearance and mobility parameters. Significant alterations observed were: pronounced nasolabial sulcus; flaccid or arched cheeks; labial sealing with tension or absence of sealing; and depressed labial commissures. Alterations in mobility were few, between 20.6% and 33.8%, with higher prevalence of alterations when raising the tongue, lateralizing air inflated in cheeks and jaw. There was no relationship between these findings and the progression of age and socioeconomic classes. Women were more likely to show normal appearance of lips and some alterations in lips mobility. The number of teeth was associated with the volume and shape of lips and with jaw mobility. In addition, the use of dental prosthesis was shown to be significantly related to the nasolabial sulcus aspect and the configuration/tension of cheeks. **Conclusion:** This study suggests normal patterns of oromyofacial system in most functionally independent elderly individuals. It supports multidisciplinary action for prevention, promotion, and treatment of the elderly population's oral functions.

RESUMO

Objetivo: conhecer as características orofaciais de idosos funcionalmente independentes e analisar a associação com a idade, gênero, nível socioeconômico e estado dentário. **Método:** estudo observacional, transversal de caráter analítico com amostra não probabilística. Foi aplicado o instrumento validado "Protocolo de Avaliação Miofuncional Orofacial com Escalas para Idoso" em sujeitos funcionalmente independentes com idade igual ou acima de 60 anos, em boas condições de saúde segundo avaliação geriátrica padronizada, intitulada Protocolo de Avaliação Multidimensional do Idoso. **Resultados:** os idosos apresentaram padrões de normalidade acima de 60% nos parâmetros de aspecto e mobilidade das estruturas. As alterações significantes foram: sulco nasolabial acentuado; bochechas flácidas ou arqueadas; vedamento labial com tensão ou ausência de vedamento e comissuras labiais deprimidas. As alterações de mobilidade foram pequenas, entre 20,6% e 33,8%, com maior prevalência na elevação da língua e lateralização do ar em bochechas infladas e da mandíbula. Não houve relação destes achados perante a progressão da idade e as classes socioeconômicas. As mulheres apresentaram maior chance de exibirem aspecto normal dos lábios e alguma alteração da mobilidade. O número de dentes associou-se com o volume e a configuração dos lábios e a mobilidade da mandíbula. Além disso, o uso de prótese dentária associou-se significativamente com o aspecto do sulco nasolabial e a tensão/configuração das bochechas. **Conclusão:** este trabalho sugere que o sistema oromiofacial encontra-se dentro dos padrões de normalidade na maioria dos idosos funcionalmente independentes. O que ampara a atuação multiprofissional na prevenção, promoção e tratamento da saúde oromiofuncional dos idosos.

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INTRODUCTION

The increase in life expectation of the world population is a human achievement. However, this fact entails increased social and economic demands in all countries where it occurs[1]. In line with this worldwide logic, aging has gradually become an important focus of health care[1]. Previous studies have shown that individuals can age well by adopting healthy habits and eliminating or reducing risk factors, diseases, and functional disabilities. Multidimensionality of healthy aging is characterized by keeping mental, physical, social, and emotional health, as well as by an active involvement in everyday activities[2].

Maintaining the ability to carry out activities of daily living (ADL) is a key element to classify elders as functionally independent[2]. Cognitive decline is a common condition among the elderly and is related to several etiologies, among them dementias[3]. Mild Cognitive Impairment (MCI) assails 15% of the elderly population and is defined as an intermediary condition or state between the cognitive changes inherent to aging and dementias. This process cannot be considered as inexorable, as 25 to 30% of people in this condition can recede to normal cognition[4,5]. Notwithstanding the presence of mild cognitive impairment, people with MCI remain functionally independent or present discrete difficulties in performing ADL. Therefore, if they don't present other major health conditions, they may be part of the healthy aging group[2].

In face of the natural aging process, among general structural physiological changes, disorders arising in the stomatognathic system are usually associated with changes in teeth, facial bones, phono-articulatory organs, and neurological control of muscular fibers, which may determine the sensory-motor and functional deficit of these structures[6-8].

Orofacial myofunctional changes in the aging process are still little known. For this reason, using standardized protocols provides for appropriate comparison between different moments and individuals, in order to obtain the best diagnosis and increase therapeutic potential[9].

Given the above, the hypothesis that changes in the aspect and mobility of the stomatognathic system occur as a result of the senescent process, with higher prevalence of disorders in edentulous elders classified under the lower socioeconomic statuses, has put this research forward. The objective of this study was to understand the main orofacial characteristics of functionally independent elderly and to analyze the existence of an association with age, gender, socioeconomic, and dental status.

METHODS

This is a cross-sectional observational and analytic study composed by a non-probabilistic convenience sample. The simple random sample calculation indicated the need to evaluate at least 65 elderly individuals, considering the monthly presence historical series of the population under study, the expected collection time, a sampling error of 5% and a significance level of 5%. This work was approved by the Research Ethics Committee of Universidade Federal de Minas Gerais under protocol 18724513.1.0000.5149. The study was conducted at Instituto Jenny de Andrade Faria (IJAF) de Atenção à Saúde do Idoso in Hospital das Clínicas of Universidade Federal de Minas Gerais (HC-UFMG). IJAF is a reference health, diagnostics, and treatment center for cognitive disorders and diseases that assail the elderly population under the National Health System (SUS) in Belo Horizonte, composed by a multidisciplinary team of health care professionals. This service makes use of a standardized geriatric assessment, Protocolo de Avaliação Multidimensional do Idoso [Protocol for Multidimensional Assessment] which consists in applying different functional, cognitive, psychiatric, and behavioral assessment instruments previously described in other studies carried out at IJAF[10,11]. In addition, in order to investigate evidence of sarcopenia, the Body Mass Index (BMI) - BMI = weight (kg) divided by height (m) squared is calculated for each patient in IJAF using cut-off points: thinness or low weight (BMI <22 kg/m²); eutrophy (BMI 22 to <27 kg/m²); overweight (BMI 27 to <30 kg / m²); and obesity (BMI ≥ 30 kg / m²), according to the Nutrition Screening Initiative criteria - NSI 2000[12]. The calf circumference (CC) is also measured - CC = with the elderly person sitting, knees flexed at an angle of ninety degrees with the floor. This is another interesting indicator of sarcopenia, where a positive signal is considered when the measurement is less than or equal to 31 cm[12]. Depending on the clinical indication, laboratory and neuroimaging exams, such as computed tomography of the skull and/or nuclear magnetic resonance of the brain, are also associated.

The elderly population in this study was randomly recruited from their attendance to the IJAF Mild Cognitive Impairment outpatient clinic (MCI - IJAF) in the period between August 2013 and March 2014. The objective of MCI - IJAF is to evaluate and follow-up individuals with a diagnostic hypothesis of MCI. In addition to the aforementioned clinical-geriatric evaluation, the individuals were also submitted to a neuropsychological assessment protocol elucidated in a previous study with this same population[10]. Diagnosis confirmation was carried out through neuropsychological evaluation according to the recommendations of The National Institute on Aging and the Alzheimer's Association[13].

The study sample excluded individuals below 60 years of age, elderly individuals previously submitted to some type of speech-language intervention, people with cognitive disabilities, intellectual impairment and/or deficits in comprehension and expression that could compromise the performance of tests, victims of traumatic brain injury and stroke, patients with neuromuscular diseases, facial paralysis, or craniofacial anomalies, and individuals with one or more complaints of signs and/or symptoms of dysphagia. This information was obtained through the anamnesis and by means of a review of the patient's Protocol for Multidimensional Assessment.

Sixty-eight individuals with MCI or normal cognition who were included in the other criteria of this study and agreed to participate in the study by signing the Informed Consent Form were selected.

The individuals selected were submitted to a speech-language pathology evaluation by the lead researcher, initially through an anamnesis/interview that included the Brazilian Economic Classification Criteria (Brazilian Criteria/CCEB)[14]. Then, inspection

of oral condition was performed with natural teeth count and application of the item "Use of Prostheses" of the Field Team Manual of the National Oral Health Research of the Ministry of Health[15]. Finally, the Orofacial Myofunctional Evaluation with Scores for Aged Protocol[9] (OMES-A or AMIOFE-I in Portuguese language) was applied as a baseline to characterize the conditions of the stomatognathic system. A description of each finding was performed for qualitative analysis, as recommended by the authors of the protocol. For quantitative analysis, we chose to present the results in dichotomous categories in order to optimize their interpretation. Options deviating from "normal", "normal for their age", or "normally carries out the task" were considered in aggregate as "alterations".

It is worth noting that in this study only two axes of the protocol were analyzed, namely: Aspect/Appearance/Posture and Mobility. The analysis of oromyofunctional functionality (Functions axis) was excluded from this study, as we believe that an exclusive theoretical understanding of this topic is necessary to better characterize it.

Each participant was filmed during the application of the protocol with Sony Cyber-shot DSC-T10® equipment. The recording adopted the following script: recording of a static image (average duration of 10 seconds) to evaluate the appearance and posture of the components of the stomatognathic system and mobility tests of lips, tongue, jaw, and cheeks.

After completion of the collection, another blind evaluator, in this case a speech-language therapist with experience in the field of oral motricity and gerontology, received 10% of the sample for analysis - corresponding to seven random recordings of the AMIOFE-I application previously performed by the lead researcher - and completed her evaluations and judgments on blank AMIOFE-I protocols. The same procedure was carried out with the lead researcher, who also received the same seven random recordings for further assessments. Intra-examiner (lead researcher) agreement and between the two evaluators was performed using the Kappa coefficient[16]. Levels of agreement between the examiners of each topic of the protocol ranged from moderate to excellent (lowest = 0.588 and highest Kappa = 1.00). This variation can be justified by the fact that the AMIOFE-I protocol is based on subjective analyses influenced by different theoretical training and clinical experience, although the examiners have undergone previous training. Intra-examiner agreement ranged from substantial to excellent results (lowest = 0.696 and highest Kappa = 1.00), confirming the high reliability and reproducibility indexes of the analyses.

A descriptive analysis of the frequency distribution of categorical variables was performed. As to continuous variables, an analysis of the central (mean) and dispersion (standard deviation) measures was performed. The chi-square and Fisher's exact tests were used as quantitative association measures. In judging continuous variables related to the categorical ones, we performed comparisons of the means through Linear Regression, Student's T-test, ANOVA, Mann-Whitney, and Kruskall-Wallis. In all analyses, a significance level α of 0.05 was considered using software R version 3.1.1.

RESULTS

Sixty-eight elderly individuals with average age of 75.12 years (minimum age 62, and maximum 92 years), standard deviation of 6.76, were assessed, where most were female (63.2%). Total natural teeth average was 6.68 and mode equal to O, which shows that the majority was edentulous (51.5%). Half of the sample presented edentulism, and the other half, partial teeth loss, where 79.4% used some type of prosthesis in the upper arch, and 61.8%, in the lower. The type "full dental prosthesis" was the most prevalent (57% in the upper arch and 38% on the lower arch).

The population studied had preserved functionality. However, because it was a sample of elderly individuals, it was preconized to better characterize the sample, indicating comorbidities and socioeconomic data, as shown in Graph 1.

Also with regard to characterization of the sample, 65 elderly individuals were subjected to sarcopenia triage and a mean BMI = 26.84668 kg/m^2 was found (mode = 24.902; standard deviation = 4.459304; minimum = 17.110 kg/m^2 and maximum 44.180 kg/m^2), where 25% of these presented BMI = or< 24.1860 kg/m^2 ; and mean CC = 36.27 cm (mode = 36; standard deviation = 3.913; minimum = 28cm and maximum 47cm), where only 25% of these presented CC = or< 33cm. There was no statistically significant relationship between these sarcopenia parameters and the orofacial characteristics of the sample.

The findings regarding aspect/posture and mobility of the stomatognathic system's structure were mostly classified as normal. Impairments, when present, were more prevalent in cheeks, jaws, and tongue. More details are found in Chart 1 and Tables 1 and 2.

There was a significant association between the classes defined by Brazilian Criteria/CCEB and the number of natural teeth present in the oral cavity, more precisely between Classes B1 and the others (A1, A2, B2, C1, C2, D, E) upon assessment of both arches (p=0.009) and upper arch (p=0.009). In the lower arch, there was a statistically significant difference only between Classes B1 and B2, and C2 and D (p=0.009). Overall, elderly individuals from higher socioeconomic classes presents a higher number of natural dental elements compared to the lower classes.

The majority of the sample did not present statistically significant associations between the number of teeth and orofacial characteristics, except for the relation between the number of natural teeth and the volume and configuration of the lips (p = 0.045) and jaw mobility (p = 0.048), shown in Table 3.

Regarding the use of upper and lower oral prostheses, statistically significant associations were observed with the perioral region appearance (Table 4).

There was no statistically significant relationship between the orofacial characteristics of the elderly individuals in this study and the progression of age or social class, but an association was found regarding genders. Women were approximately three times more likely to have normal lip appearance (p = 0.004). On the other hand, they were shown to be four times more likely to present impairment in lip mobility (p = 0.028).

Finally, an analysis of the aspect/posture/mobility of the orofacial structures of the sample was performed in order to
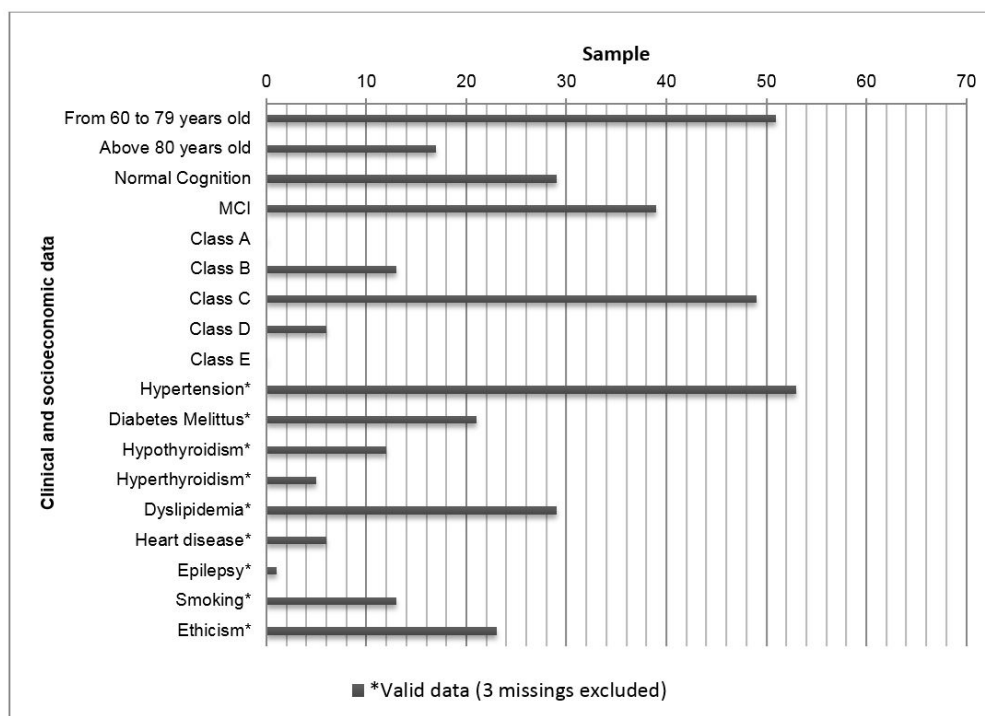
Graph 1. Clinical, cognitive, and socioeconomic characteristics of the population studied

Chart 1 . Results of orofacial evaluation with scores from AMIOFE-I protocol. Maximum scores of the protocol, means and standard deviation (SD) of evaluations of examiner 1 (protocol validation) versus lead researcher (present study)

AMIOFE-I items	AMIOFE-I Maximum Score	Results of the Study for Validation of AMIOFE-I protocol (Examiner 1)		Results of the present study (Lead researcher)	
		Mean	SD	Mean	SD
Appearance/Posture					
Lips	12	8.41	1.94	10.24	1.42
Mental	8	6.35	1.06	7.26	1.33
Jaw	12	10.47	1.28	11.38	1.00
Cheeks	8	5.88	0.93	6.41	1.02
Face	8	4.94	0.83	6.41	1.16
Tongue	8	6.24	1.03	7.78	0.64
Mobility					
Lips	24	16.12	2.83	23.44	1.26
Tongue	36	17.94	3.21	33.54	5.14
Jaw	30	19.00	5.20	28.72	2.08
Cheeks	24	15.94	4.59	22.28	3.08

show probable cause-effect relationships of the appearance of stomatognathic structures with one another, but there were statistically significant associations only between lip posture and cheek appearance, as well as between nasolabial sulcus and lip appearance, as shown in Table 5.

DISCUSSION

The majority of the population studied was proven to be edentulous. Previous cross-sectional[17-20] and demographic[21] studies with Brazilian elderly individuals have shown that edentulism varies from 61 to 87.1%. However, all of these studies indicate that tooth loss can not be considered as a natural process of aging, emphasizing the need to implement public health prevention and promotion policies[19,20].

The use of dental prostheses results as a consequence of these high rates of dental loss. In the present study, it was evidenced that the majority are users of dental prosthesis, contrary to the findings observed in Recife[18] and Porto Alegre[17], in which most of the participants did not use a prosthesis. This disagreement may be explained by the different composition f the samples, characterized by the presence of institutionalized and more dependent individuals. On the other hand, other studies corroborate the present sample. A research conducted in Distrito Federal[19],

Table 1. Appearance of orofacial structures

Appearance		%
Face		
	Symmetrical	73.5
	Asymmetrical	26.5
Nasolabial Sulcus		
	Normal for the age	39.7
	Pronounced	60.3
Volume of cheeks*		
	Normal	72.1
	Increased	27.9
Configuration of Cheeks*		
	Normal	20.6
	Flaccid/Arched	79.4
Appearance/Volume of Mental Muscle		
	Normal	72.1
	Altered/Increased	27.9
Lip Sealing (Lips - occlusion)		
	Function normally	50
	Altered (occluded with tension or absence of sealing)	50
Lip Volume and Configuration		
	Normal	60.3
	Altered	39.7
Labial Commissures		
	Normal (at the oral rhyme level and symmetrical)	47.1
	Depressed (below the oral rhyme, asymmetrical, and/or equally sagging)	52.9
Tongue Posture		
	Normal (contained in the oral cavity)	100
	Altered (presence of clenching or between arches)	0
Tongue Volume		
	Normal	86.8
	Altered (increased volume and/or enlarged tongue)	13.2
Hard Palate		
	Normal	92.6
	Reduced Width	7.4

*Percentage referring to 59 valid evaluations, exclusion of 9 missings

Table 2. Mobility of orofacial structures

Mobility		%
Lips		
	Normal Performance[1]	79.4
	Insufficient or absent abilities	20.6
Cheeks*		
	Normal Performance[2]	76.3
	Insufficient or absent abilities	23.7
Jaw		
	Normal Performance[3]	66.2
	Insufficient or absent abilities	33.8
Tongue		
	Normal Performance[4]	66.2
	Insufficient or absent abilities	33.8
Most prevailing alterations*: Air laterality in inflated cheeks		
	Normal	76.3
	Absent ability	8.8
Most prevailing alterations: Laterality of Jaw to the right		
	Normal	70.6
	Insufficient ability	29.4
Most prevailing alterations: Laterality of Jaw to the left		
	Normal	72.1
	Insufficient ability	27.9
Most prevailing alterations: Tongue Elevation		
	Normal	66.2
	Insufficient ability	33.8

*Percentage referring to 59 valid evaluations, exclusion of 9 missings; [1]Normality of the following movements: Protrusion, Retraction, and Laterality; [2]Normality of the following movements: Inflating, Sufflating, Retracting, and Lateralizing the air; [3]Normality of the following movements: Lowering, Elevating, Lateralizing, Protruding; [4]Normality of the following movements: Protruding, Retracting, Lateralizing, Elevating, Lowering

upon outlining the profile of oral condition in elderly women, found similar results, where 74.3% were users of full upper arch prosthesis and 47.1%, of lower arch prosthesis. A Brazilian epidemiological survey from 2010 also found similar results at the age range between 65 and 74 years old, as it similarly found a high percentage of elderly individuals using some type of dental prosthesis, where 76.5% was in the upper arch, and 53.9%, in the lower[21].

With regard to the main orofacial characteristics, the majority of the sample presented a normal appearance/posture standard of the stomatognathic system's elements, in addition to scores closer to the normal according to AMIOFE-I protocol[9]. Impairments, when present, were found mainly in the perioral region. There was a prevalence of four abnormality thresholds in this area: pronounced nasolabial sulcus; flaccid cheeks; lip sealing with tension or no sealing; and finally, depressed labial commissure.

These facial changes are notorious and have a profound effect on one's appearance. Facial aging is the result of combining bone changes with soft tissues. Thinning of the epidermis and dermis, as well as fragmented collagen fibers, are known structural modifications in aged skin. Furthermore, skeletal changes occur as age progresses; some areas continue to grow, while others present bone resorption, promoting new angles between the facial bones[22,23]. The transformation of muscular insertions associated with reduction in elasticity of the dermis, reduction of the mobility and tension of facial muscles, and increase of the subcutaneous adipose layer, make up facial flaccidity, a characteristic of aging[24-27]. Examples of these modifications combined in the stomatognathic system were evidenced by this study's sample. Elderly individuals with changes in lip occlusion presented approximately five times more chances of having flaccid and/or arched cheeks (p = 0.033) and the presence of normal nasolabial sulcus was considered a protective factor for adequate lip volume (p = 0.004) in this population.

Table 3. Association between dental elements and lip appearance and jaw mobility

Variables	Natural Teeth in the Upper Arch		
	Mean N	Standard deviation N	P-Value
Lip Volume and Configuration			
Normal	3.46	5.01	0.045*
Reduced and stretched out	1.11	3.00	
	Natural Teeth in the Lower Arch		
	Mean N	**Standard deviation N**	**P-Value**
Jaw Mobility			
Normal	5.02	5.11	0.048*
Insufficient or absent abilities	2.43	4.33	

*Logistic Regression

Table 4. Association of the Appearance of Orofacial Structures with the Use of Prosthesis

Variables	Upper Arch				Lower Arch			
	Does no use (fully or partially edentulous)	Removable partial or total and/or fixed bridge	Odds Ratio (CI*)	P-Value	Does not use (fully or partially edentulous)	Removable partial or total and/or fixed bridge	Odds Ratio (CI*)	P-Value
	N(%)	N(%)			N(%)	N(%)		
Nasolabial Sulcus								
Normal for the age	11 (78.6%)	16 (29.6%)	8.708 (2.139-35.451)	0.002**	17 (65.4%)	10 (23.8%)	6.044 (2.062-17.721)	0.001**
Pronounced	3 (21.4%)	38 (70.4%)			9 (34.6%)	32 (76.2%)		
Total	14 (100%)	54 (100%)			26 (100%)	42 (100%)		
Tension and Configuration of Cheeks								
Normal	7 (50.0%)	7 (13%)	6.714 (1.803-24.998)	0.002***	9 (65.4%)	5 (11.9%)	3.918 (1.140-13.469)	0.033***
Flaccid/Arched	7 (50.0%)	47 (87%)			17 (34.6%)	37 (88.1%)		
Total	14 (100%)	54 (100%)			26 (100%)	42 (100%)		
Labial Commissures								
At the oral rhyme level and/or symmetrical	11 (78.6%)	21 (38.9%)	0.174 (0.043-0.696)	0.014**	------	------	------	------
Below the oral rhyme and/or asymmetrical	3 (21.4%)	33 (61.1%)						
Total	14 (100%)	54 (100%)						

*Confidence Interval; **Chi-square test; ***Fischer's Exact Test

Table 5. Inter-analysis of the Stomatognathic System of the Sample

Variables	Tension and Configuration of Cheeks			
	Flaccid or Arched N(%)	Normal Tension or Configuration N(%)	Odds Ratio (CI*)	P-Value
Lip Posture				
Occluded with tension or absence of sealing	31 (57.4%)	3 (21.4%)	4.942; 1.236 (19.972):	0.033***
Occluded	23 (42.6%)	11 (78.6%)		
Total	54 (100%)	14 (100%)		
	Lip Volume and Configuration			
	Reduced or Stretched out N(%)	Normal N(%)	Odds Ratio (CI*)	P-Value
Nasolabial Sulcus				
Pronounced	22 (81.5%)	19 (46.3%)	0.196; 0.062 (-0.619):	0.004**
Normal for the age	5 (18.5%)	22 (53.7%)		
Total	27 (100%)	41 (100%)		

*Confidence Interval; **Chi-square test; ***Fischer's Exact Test

One of the most obvious hallmarks of the aging process is usually the appearance of the cheeks. Studies have shown that most elderly individuals have cheeks considered sagging, flaccid, or arched, justified by the aforementioned changes in bone aging and soft tissue[26]. A second parameter are the lips. In an analysis of photos and recordings of the perioral region in 221 subjects stratified in five groups with increasing ages, a statistically significant decrease of the thickness of the upper lip at rest and during smile was observed from 40 years of age[27]. A cephalometric analysis of 182 frontal photos of elderly individuals confirmed that the length of the upper lip increases with advancing age in relation to the length and width of the mouth. These findings were confirmed by magnetic resonance imaging and histological examination, which evidenced a significant reduction in the thickness of the medium level of the upper lip and an inversely proportional relation between the decrease in thickness of the skin and the increase of subcutaneous adipose tissue. It is worth noting that great interindividual anatomical variations produce biases in research on perioral aging[25].

Further on the peculiarities of the stomatognathic system of the sample, the mobility of phonoarticulatory organs within the normality standards corresponded to 60% of the evaluations. A previous study[17] also found a percentage above 58% of normality, particularly of lips and tongue, even in institutionalized elderly population. This data is only contrary to the results of a study carried out in 2010 at a Long-Term Care Facility for the Elderly (LTCF) in Recife[18], in which a tendency for hypomobility of the lip musculature was observed in 69% of individuals, 77% of the cheeks and 85% of the tongue. This discrepancy can be explained by the possible composition of the sample by elderly individuals that had been victims of vascular events, neuromuscular diseases, dysphagia, facial paralysis, or sarcopenia, as it was not clear if these comorbidities were considered as sample exclusion factors.

Of the functionally independent elderly individuals participating in this study, 40% presented hypomobility of stomatognathic system structures. A percentage of 23 to 34% of elderly individuals with insufficient or absent skills was found when lateralizing the air in the cheeks and jaw to the right and left. A probable explanation would be a difficulty in understanding the orders requested, as they are actions seldomly performed in a conscious manner by the elderly individuals evaluated in their daily routine. In addition, there is a reduction in oral stereognosis of the elderly[28], which, in turn, may influence or be related to reduced oral motor activity[28,29]. The change in language mobility was the most important, corroborating Lima et al.[9]. The difficulty or absence of tongue elevation is highlighted, since it represents approximately 25% of the sample. This tongue mobility deficit seems to be associated with an important milestone for orofacial functions in the elderly: the presence of sarcopenia, considered to be a condition in which muscular strength is insufficient to perform daily life activities[30]. According to the size and shape of an intraoral bolus of food, the tongue needs adequate strength, agility, and sensitivity[29], which reinforced that nutritional and physical characteristics must be taken into account in the tongue's aging process in order to avoid mainly dysphagia[30].

Most of the elderly individuals evaluated in the present study did not present sarcopenia, 75% of the sample presented a BMI at least eutrophic and CC above the expected normality in the elderly. Apparently consonant with this, more than 66% presented tongue mobility without alterations, and more than 86% had normal tongue volume, although no statistically significant relationship was found between these findings and the absence of sarcopenia. In addition, all the mobility scores found were close to those considered normal by the AMIOFE-I protocol and also higher than the sample scores of the validation study of the same protocol[9], in which the presence of sarcopenia was not investigated. This marker could be the reason for the divergent findings.

Clark and Solomon[24] evaluated the strength applied in some movements of the lips, tongue, and cheeks, having found greater lip agility and strength in men compared to women; less protrusion and lateralization of the tongue in the older participants compared to the younger ones; as well as lower tongue elevation of the elderly individuals in relation to the middle-age group, corroborating with the results of the present study.

All of these structural and mobility changes at some point may be self-compensated by the elderly during oral functions. However, they are more prone to weakening of these functions in the future[17]. Once the changes are settled, they can not be solved, for example, only by implementing new dental prostheses, as evidenced by the findings of this study. Here, the sample - even the individuals using some type of dental prosthesis in upper and/or lower arches - maintained structural alterations of the stomatognathic system, such as pronounced nasolabial sulcus, flaccid and arched cheeks, and asymmetrical labial commissures and/or below the oral rhyme. Thus, the need to care for the elderly in an interdisciplinary manner is clear, including a speech pathologist mainly within primary health care, focusing on the integrality of oral health[6].

Several studies associate these changes in appearance and mobility of the face with age progression, especially compared with young individuals[22-25]. However, this progressive relationship was not found in the present article, probably because the sample is composed exclusively of patients aged 60 years or older, where structural changes are believed to be already in place and tend to advance slowly.

Most studies, including the present sample, do not use gold standard monitoring of aging processes. Ideally, it would be interesting to make linear observations of the same individuals longitudinally. However, it should be admitted that such studies are difficult to perform and, based on the emerging need for relevant data, recent research is using association of several methods, which has produced realistic and reliable results[23,27].

It is also worth mentioning that this study focused most of the comparison with studies composed by elderly individuals. The literature used to discuss the findings, for the most part, was turned to a population of institutionalized elderly people, which may be justified due to the greater ease of access to limited populations for research. The lack of a more detailed comparison with non-institutionalized elders generates speculations. We suggest approaching a functionally independent elderly population for the next works on this topic.

The few observed changes in appearance, postural condition, and mobility of the stomatognathic system of these elderly individuals can be considered part of the changing process of the dental state. One must question, however, if these small changes observed can affect oral functions, which points to a need for more research and continuous multiprofessional action in public policies for prevention, promotion, and treatment of oromyofunctional health in the elderly.

This study's findings add relevant information about the oromyofacial system of functionally independent elderly to the literature and allows more conscious and concrete interpretations about orofacial alterations beyond senescence. Understanding the natural evolution of physiological processes lays a foundation for preventive and curative activities in all areas of health science. This study's results meet this premise, in addition to having high-potential clinical applicability for all speech-language therapists dealing with the elderly population.

CONCLUSION

Orofacial appearance/posture in the functionally independent elderly individuals included in this sample was, for the most part, within the normality standards, where alterations were found mainly in the perioral region, if at all. Four abnormality thresholds in this area are emphasized: pronounced nasolabial sulcus; flaccid cheeks; lip sealing with tension or no sealing; and finally, depressed labial commissure. Normal mobility of the phonoarticulatory organs was found in 60% of the evaluations, while the rest had insufficient or absent abilities upon lateralizing the jaw and air in the cheeks, besides alterations upon requesting elevation of the tongue.

Age progression did not produce changes in the stomatognathic system of this sample; differences between the genders were found only upon analysis of the lips. The socioeconomic classes did not present a significant association with the orofacial specificities found. However, higher mean values of natural teeth were observed in the most favored classes. Furthermore, the dental state and use of prostheses seem to promote alterations mainly in the perioral region.

The results found reiterate the need to add public policies aimed at oromyofunctional health of the population in general, besides demonstrating the importance of conducting new studies on the subject.

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Author contributions

All authors effectively participated in the construction of this work, where DNMS is the lead author responsible for data search and systematization, evaluation of the elderly population and textual production. The other authors, EABC, HMGB and MACB, provided assistance in the methodological design and textual production.