Original Research
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A retrospective multicenter study of oral and maxillofacial lesions in older people

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Abstract: Few studies on the distribution of oral diseases in older people are available in the literature. This study aimed to investigate the prevalence and demographic characteristics of oral and maxillofacial lesions in geriatric patients (age ≥ 60 years). A retrospective descriptive cross-sectional study was performed. Biopsy records were obtained from archives of three Brazilian oral pathology centers over a 20-year period. Data on sex, age, anatomical site, skin color, and histopathological diagnosis were collected and analyzed. Pearson's chi-square test was used to evaluate differences in the frequency of the different oral and maxillofacial lesion groups. A total of 7,476 biopsy records of older patients were analyzed. Most cases were diagnosed in patients aged 60 to 69 years (n = 4,487; 60.0%). Females were more affected (n = 4,403; 58.9%) with a female-to-male ratio of 1:0.7 ($p < 0.001$). The tongue (n = 1,196; 16.4%), lower lip (n = 1,005; 13.8%), and buccal mucosa (n = 997; 13.7%) were the most common anatomical sites. Reactive and inflammatory lesions (n = 3,840; 51.3%) were the most prevalent non-neoplastic pathologies ($p < 0.001$), followed by cysts (n = 475; 6.4%). Malignant neoplasms were more frequent (n = 1,353; 18.1%) than benign neoplasms (n = 512; 6.8%). Fibrous/fibroepithelial hyperplasia (n = 2,042; 53.2%) ($p < 0.001$) and squamous cell carcinoma (n = 1,191; 88.03%) ($p < 0.001$) were the most common oral lesions in older adults. Biopsy data allow the accurate characterization of the prevalence of oral and maxillofacial lesions, supporting the development of public health policies that can enable the prevention, early diagnosis, and appropriate treatment of these lesions. Also, they bring valuable information that helps dentists and geriatricians diagnose these diseases.

Keywords: Epidemiology; Pathology, Oral; Mouth.

Introduction

One of the most significant concerns and achievements of a country is to ensure its population's aging with health and quality of life.[1] In recent decades, the percentage of people aged 60 years and over has grown faster worldwide than any other age group.[1-3] Current estimates show that the number of individuals over 60 years will be about 1.2 billion in 2025 and approximately 2 billion in 2050, and 80% of them will be living in developing countries.[4] In Brazil, life expectancy has also grown

progressively over the years. In 54 years, according to the Brazilian Institute of Geography and Statistics (IBGE), Brazilian life expectancy increased by 26.6 years, from 48 years in 1960 to 74.6 years in 2014.[5] This fact demonstrates that the country's development has improved the population's quality of life and has impacted life expectancy in recent decades, following a global trend.

This growing number of older people is accompanied by a higher incidence of oral and systemic diseases.[1,6-8] Studies have shown that the relative frequency of oral potentially malignant disorders (OPMDs) and malignant tumors was 10 times more common in this population than in younger individuals, also increasing with advancing age in older individuals.[1,9] Other studies have also shown a statistically higher incidence of reactional and inflammatory lesions, malignant epithelial neoplasms, premalignant lesions, autoimmune diseases, and salivary gland tumors in older adults when compared to younger individuals.[10,11] These data support that age has significantly influenced the prevalence and pattern of oral diseases observed in these individuals. This higher prevalence of oral lesions in older adults merits consideration. Public health policies that guarantee an early diagnosis and proper treatment of these diseases should be developed to improve the quality of life of this population.[1,2,6,7]

Most previous studies conducted in Brazil and in other countries are based only on clinical data without histopathological confirmation.[12-19] Considering that multicenter studies based on histopathological records can provide more accurate data and are scarce in the literature,[1,6] this study aimed to evaluate oral and maxillofacial lesions diagnosed in older people (aged ≥60 years) in three oral pathology centers in Brazil. To the best of our knowledge, this study is the largest series of oral lesions in Brazilian older adults to date.

Methodology

Study design and sampling

In this retrospective multicenter study (1999–2019), histopathological records were retrieved from the archives of three Brazilian oral and maxillofacial pathology centers (Table 1). All older people (≥ 60 years) with lesions in the oral and maxillofacial region who underwent histopathological examination at the participating centers were included in the present study. Data such as age, sex, skin color, anatomical site, and clinical and histopathological diagnosis were obtained from biopsy records and analyzed. Biopsy results that showed no pathological changes were excluded from the present study.

Oral and maxillofacial lesions were grouped into the following categories: a) reactive and inflammatory lesions, b) benign and malignant neoplasms, c) OPMDs, d) cysts, e) immunological diseases, f) infectious diseases, g) non-neoplastic bone lesions, h) pigmented and calcified lesions, and i) normal variations of the oral cavity and tumor-like malformations. Neoplasms were classified according to the current edition of WHO Classification of Tumors.[20] Other categories were classified according to previous studies[1,6] and the Manual of Oral and Maxillofacial Pathology, 4th edition.[21] Additional immunohistochemical analysis was performed when routine staining (hematoxylin-eosin staining) was insufficient to establish the final diagnosis.

Table 1. Sources of the reviewed cases.

Institution	State	Years	Lesions biopsied during the study period	Geriatric oral lesions (%[a])	%[b]
UFRJ[c]	Rio de Janeiro	1999–2019	13,679	3,629 (45.3)	26.5
UNIFOR[d]	Fortaleza	1999–2020	16,977	3,637 (45.4)	21.4
UEPB[e]	Paraíba	2012–2019	3,992	749 (9.3)	18.8
Total	–	–	34,648	8,015 (100)	23.1

[a]Percent in relation to the number of cases of oral lesions in older people; [b]Percent of the sample of oral lesions in older people at each center; [c]Department of Oral Diagnosis and Pathology, School of Dentistry, Federal University of Rio de Janeiro (Southeast region); [d]School of Dentistry, University of Fortaleza (Northeast region); [e]Department of Dentistry, State University of Paraíba (Northeast region).

The study was approved by the Ethics Committee of the State University of Paraíba (protocol number: 61639722.9.0000.5187).

Data analysis

Descriptive and quantitative data analyses were performed using the Statistical Package for the Social Sciences (SPSS) for Windows 20.0 (SPSS. Inc., Chicago, USA). Continuous variables were expressed as mean, median, and standard deviation. Categorical variables were defined as the absolute number of cases and percentage values. The chi-square test and Fisher's exact test were used to evaluate the association between the different groups of oral lesions and demographic characteristics, adopting a *p*-value of ≤0.05 and a 95% confidence interval.

Results

A total of 34,648 surgical specimens were received at the participating centers; of these, 8,015 (23.1%) were diagnosed in older people (≥ 60 years). However, 539 records were excluded from the analysis because of incomplete data, insufficient material for analysis, and inconclusive/non-specific histopathological findings (Figure 1). The allocation of cases by the centers is presented in Table 1. There was a homogeneous distribution of groups of oral lesions among the participating centers in the present study, and no difference in the prevalence of oral lesions by geographic region (northeast *vs.* southeast) was observed (Figure 2A-D).

Most cases affected women (n = 4,403; 58.9%), with a male-to-female ratio of 0.7:1 ($p < 0.001$) (Figure 3), and 51.8% (n = 2,942) of patients were white ($P = 0.069$). Lesions were found on various anatomical sites: tongue (n = 1,196; 16.4%), lower lip (n = 1,005; 13.8%), buccal mucosa (n = 997; 13.7%), alveolar ridge (n = 962; 13.2%), palate (n = 849; 11.7%), intraosseous sites in the mandible and maxilla (n = 832, 11.4%), floor of the mouth (n = 355; 4.9%), gingiva (n = 328; 4.5%), buccal vestibule (maxillary and mandibular) (n = 315; 4.3%), upper lip (n = 183; 2.5%), retromolar trigone (n = 144; 2.0%), labial commissure (n = 39; 0.5%), maxillary sinus (n = 14; 0.2%), parotid gland (n = 14; 0.2%), oropharynx (n = 8; 0.11%), submandibular gland (n = 6; 0.08%),

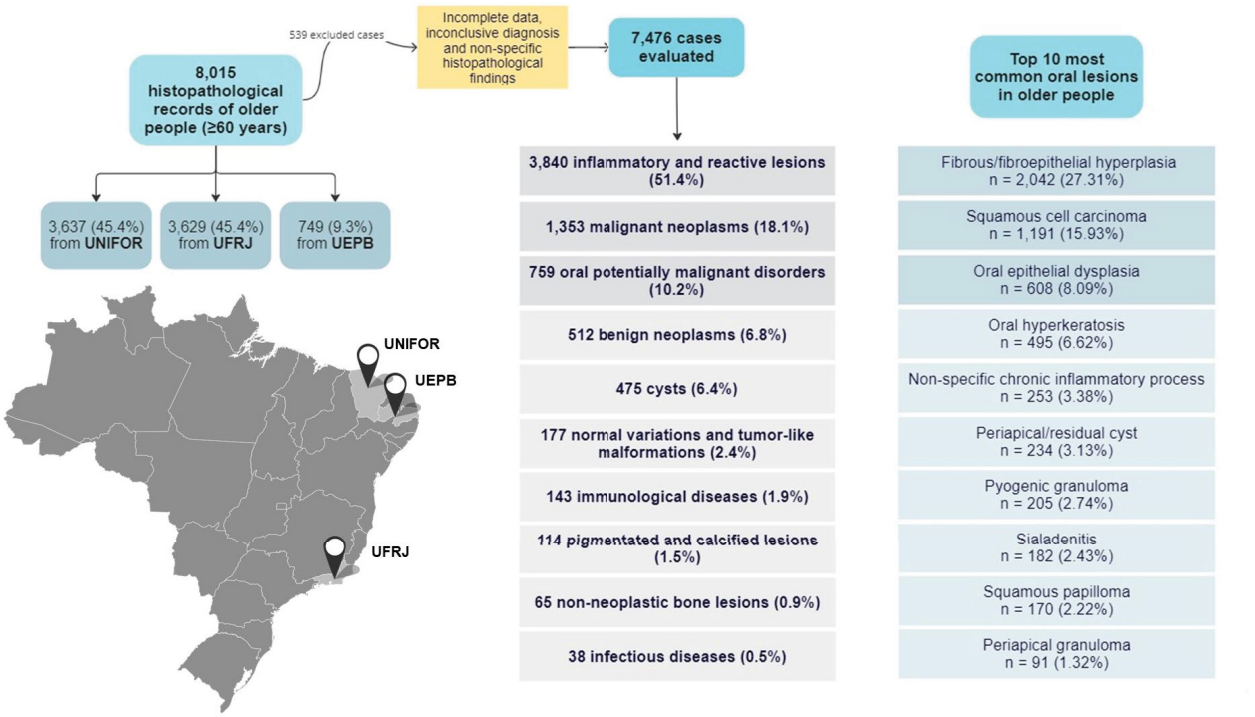

Figure 1. Flowchart showing the sample selection from the three oral pathology centers participating in the present study.

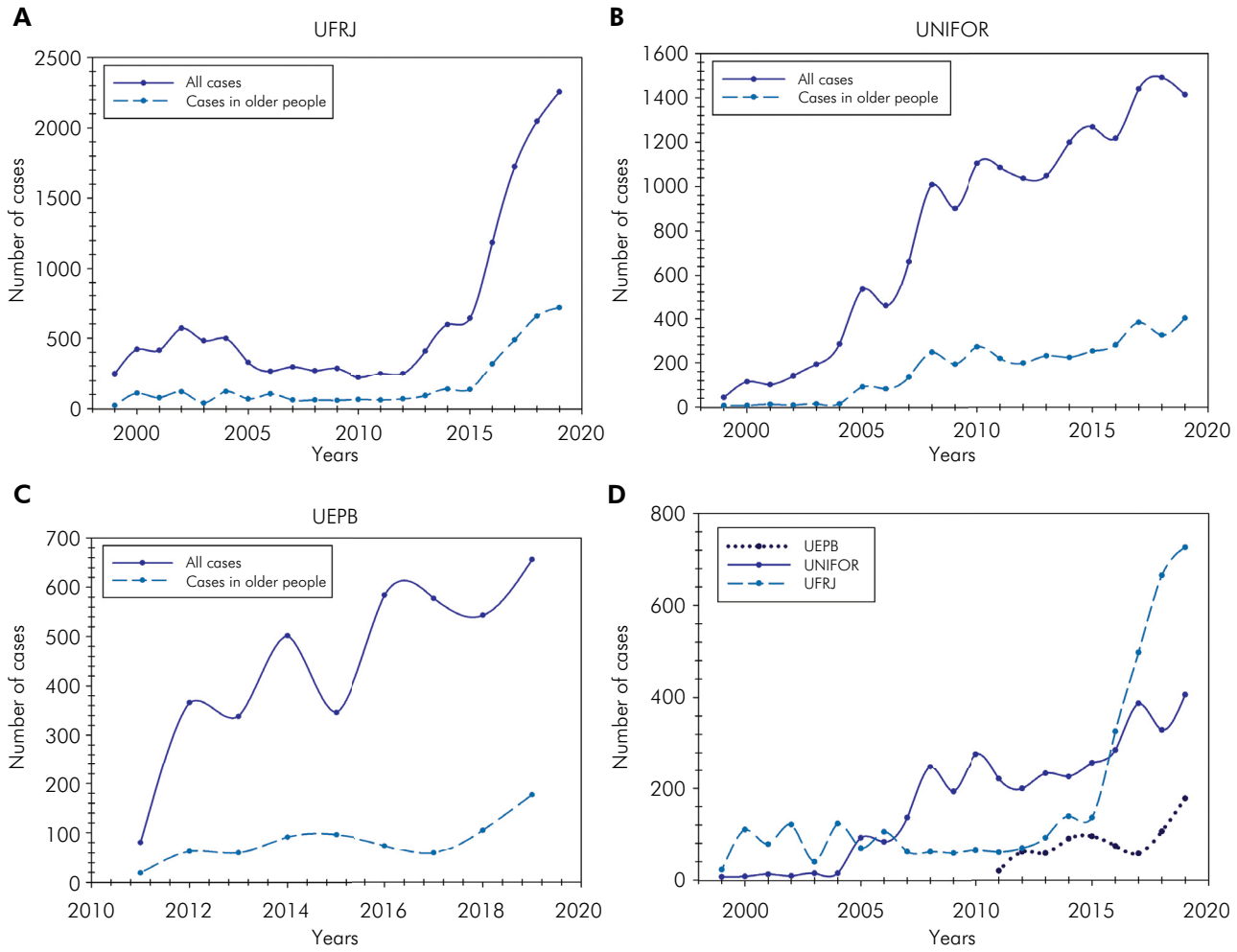

Figure 2. (A-C) Total number of cases diagnosed at each center and number of lesions diagnosed in older patients between 1999 and 2019. (D) Comparison between the number of cases diagnosed in older individuals at each center.

sublingual gland (n = 1; 0.01%), and extraoral sites (n = 30; 0.4%). There were 198 cases with unspecified intraoral sites. Despite this wide distribution, soft tissue lesions most commonly occurred on the tongue (16.4%), whereas intraosseous lesions occurred mainly in the mandible (n = 513; 7.0%) ($p < 0.001$).

Patients were diagnosed mainly in the age group of 60 to 69 years (n = 4,487; 60.0%) and the most common lesion groups were reactive and inflammatory lesions (n = 3,840; 51.3%) and malignant neoplasms (n = 1,865; 24.9%), followed by potentially malignant disorders (n = 759; 10.1%) (Table 2). There was a statistically significant association between the frequency of reactive and inflammatory lesions and neoplasms and the first decade in the age group of older adults (60–69 years) ($p < 0.001$).

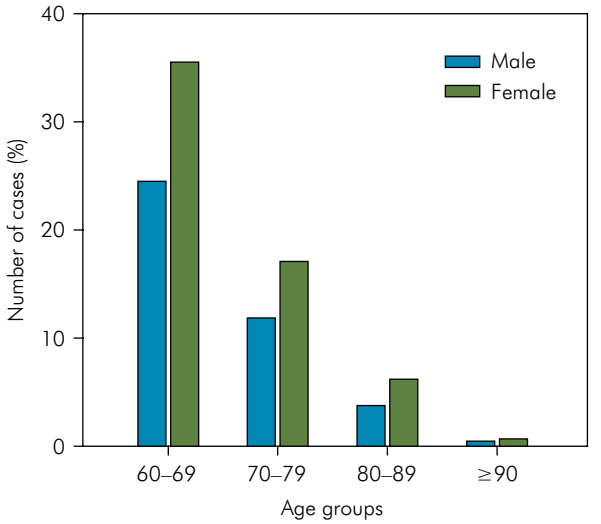

Figure 3. Distribution of oral and maxillofacial lesions diagnosed in older people according to age.

Table 2. Age and sex distribution of oral and maxillofacial lesions diagnosed in older people.

Lesions	Sex				Mean age	Age				Total		Agreement between clinical and histopathological diagnoses		
	Male	Female	NI	M:F ratio	(± SD)	6–69	70–79	80–89	≥ 90	n	%	Yes	No	NI*
Reactive and inflammatory lesions	1,22	2,582	38	1:2.1	68.30 ± 6.87	2,452	1,091	273	24	3840[a]	51.3	1760 (55.9%)	1389 (44.1%)	691
Malignant neoplasms	814	530	9	1.5:1	71.67 ± 8.79	656	417	240	40	1353[a]	18.1	502 (53.3%)	440 (46.7%)	411
Benign neoplasms	196	313	3	1:1.6	69.10 ± 7.18	309	147	52	4	512	6.8	178 (59.5%)	121 (40.5%)	213
Potentially malignant disorders	362	395	2	1:1.1	69.78 ± 7.74	431	223	96	9	759	10.1	293 (51.0%)	282 (49.0%)	184
Cysts	247	225	3	1.1:1	68.07 ± 6.88	314	126	32	3	475	6.4	192 (48.7%)	202 (51.3%)	81
Variations of normality and tumor-like malformations	70	105	2	1:1.5	69.86 ± 6.94	96	60	20	1	177	2.4	103 (66.0%)	53 (34.0%)	21
Immunological diseases	29	113	1	1:3.9	69.41 ± 7.06	86	43	13	1	143	1.9	87 (67.4%)	42 (32.6%)	14
Pigmented and calcified lesions	35	78	1	1:2.2	67.24 ± 6.58	82	25	7	0	114	1.5	43 (49.4%)	44 (50.6%)	27
Non-neoplastic bone lesions	16	48	1	01:03	68.33 ± 7.42	43	16	6	0	65	0.9	23 (48.9%)	24 (51.1%)	18
Infectious diseases	24	14	0	1.7:1	70.26 ± 7.32	18	15	5	0	38	0.5	28 (82.4%)	6 (17.6%)	4
Total	3,013	4,403	60	1:1.4	69.15 ± 7.47	4,487	2,163	744	82	7,476	100	3,209 (55.2%)	2,603 (44.8%)	1664

NI: not informed; M: male; F: female; SD: Standard deviation. [a]Person's chi-square test $p < 0.001$. *Clinical diagnosis was not informed.

Reactive and inflammatory lesions occurred mainly in women (n = 2,582; 67.2%) with a female-to-male ratio of 1:0.5. These lesions were usually found in patients aged between 60 and 69 years (n = 2,452; 63.9%) and white (n = 1,464; 38.5%). The most common lesion was inflammatory fibrous/fibroepithelial hyperplasia (n = 2,042; 53.2%) ($p < 0.001$). A history of ill-fitting dentures was found in 18.8% of these cases (n = 383) (Table 3).

Regarding neoplasms, 72.5% (n = 1,353) were malignant tumors and 27.5% were benign tumors (n = 512) (Table 2). About one in five older adults was diagnosed with oral cancer. Malignant tumors occurred mainly in men (n = 814; 60.6%) aged 60 to 69 years (n = 656; 48.5%) with a male-to-female ratio of 1.5:1. Although a wide variety of subtypes of malignant neoplasms were observed (Table 4), oral squamous cell carcinoma (SCC) was the most common malignant neoplasm, accounting for about 88.0% of all cancers diagnosed in this population (n = 1,191) ($p < 0.001$), followed by verrucous carcinoma (n = 29; 2.14%) and mucoepidermoid carcinoma (n = 27; 2.0%) (Table 4). About 15.2% (n = 1,138) of the older adults were smokers, among whom 35.0% (n = 398) had oral SCC and 9.8% (n = 112) had oral potentially malignant disorders. Regarding alcohol use, few cases had a history of alcohol consumption (n = 127; 1.7%); 73 of these patients (57.5%) also had SCC. On the other hand, benign neoplasms were more prevalent in women (n = 313; 61.5%) with a female-to-male ratio of 1.6:1. The most common soft tissue neoplasms were fibroma (n = 146; 28.5%), lipoma (n = 143; 27.9%), and pleomorphic adenoma (n = 40; 7.8%). Ameloblastoma (n = 65; 12.7%) was the most commonly observed benign neoplasm on intraosseous sites. However, a wide variety of benign neoplasms occurred in this population (Table 5).

Table 3. Frequency of non-neoplastic tumors and tumor-like lesions observed in older people.

Lesions	n	Sex			Age				Mean age (± SD)	%[a]	%[b]
		Male	Female	NI	60-69	70-79	80-89	≥ 90			
Infectious diseases											
Candidal infection	15	9	6	0	6	5	4	0	72.80 ± 8.64	0.20	39.5
Paracoccidioidomycosis	13	12	1	0	10	3	0	0	66.46 ± 5.44	0.17	34.2
Actinomycosis	5	3	2	0	2	3	0	0	69.00 ± 6.44	0.07	13.2
Multibacillary leprosy	1	0	1	0	0	1	0	0	75	0.01	2.6
Extrapulmonary tuberculosis	1	0	1	0	0	0	1	0	81	0.01	2.6
Larva migrans	1	0	1	0	0	1	0	0	75	0.01	2.6
Cytomegalovirus infection	1	0	1	0	0	1	0	0	75	0.01	2.6
Syphilis	1	0	1	0	0	1	0	0	72	0.01	2.6
Total (subgroup)	38	24	14	0	18	15	5	0	70.26 ± 7.32	0.51	100
Immunological diseases											
Erythema multiforme	2	2	0	0	1	1	0	0	69.50 ± 13.43	0.03	1.4
Wegener's granulomatosis	2	0	2	0	0	2	0	0	76.00 ± 0.00	0.03	1.4
Pemphigus vulgaris	7	1	6	0	4	2	1	0	69.71 ± 6.67	0.09	4.9
Lupus erythematosus	7	0	7	0	4	3	0	0	68.28 ± 7.47	0.09	4.9
Mucous membrane pemphigoid	45	11	34	0	25	14	5	1	70.97 ± 7.75	0.60	31.5
Lichen planus	80	15	64	1	52	21	7	0	68.43 ± 6.53	1.07	55.9
Total (subgroup)	143	29	113	1	86	43	13	1	69.41 ± 7.06	1.91	100
Reactive and inflammatory lesions											
Inflammatory fibrous/fibroepithelial hyperplasia[a]	2,042	571	1,455	16	1,329	572	132	9	68.02 ± 6.71	27.31	53.22
Oral hyperkeratosis	495	220	273	2	300	150	40	5	68.79 ± 7.01	6.62	12.90
Non-specific chronic inflammatory process	253	88	163	2	165	63	23	2	68.48 ± 7.25	3.38	6.59
Pyogenic granuloma	205	76	127	2	138	49	16	2	68.15 ± 7.02	2.74	5.34
Sialadenitis	182	38	140	4	117	61	3	1	67.90 ± 5.86	2.43	4.74
Periapical granuloma	91	28	59	4	64	19	8	0	66.82 ± 6.66	1.22	2.37
Osteonecrosis of the jaws	77	24	52	1	38	27	12	0	70.89 ± 7.85	1.03	2.01
Oral mucus extravasation phenomenon	64	28	36	0	42	19	2	1	67.82 ± 6.51	0.86	1.67
Peripheral ossifying fibroma	61	19	41	1	42	13	6	0	68.55 ± 6.39	0.82	1.59
Lichenoid reaction	40	7	33	0	25	14	1	0	67.17 ± 5.67	0.54	1.04
Peripheral giant cell lesion	32	17	13	2	20	10	2	0	67.46 ± 5.92	0.43	0.83
Osteomyelitis	26	3	23	0	17	8	1	0	68.19 ± 7.29	0.35	0.68
Thrombus	18	7	11	0	10	6	2	0	69.16 ± 6.87	0.24	0.47
Traumatic neuroma	14	5	9	0	5	8	1	0	71.35 ± 6.03	0.19	0.36
Eosinophilic ulcer	12	9	3	0	8	3	1	0	69.08 ± 6.86	0.16	0.31
Amyloidosis	7	1	6	0	3	2	2	0	73.57 ± 10.84	0.09	0.18
Granulomatous foreign body reaction to dermal cosmetic fillers	6	2	4	0	3	3	0	0	70.33 ± 6.59	0.08	0.16
Oral focal mucinosis	6	2	4	0	4	2	0	0	67.16 ± 5.98	0.08	0.16
Verruciform xanthoma	5	1	4	0	1	1	3	0	77.00 ± 9.92	0.07	0.13

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Continuation											
Masson's tumor	4	3	1	0	4	0	0	0	67.00 ± 1.82	0.05	0.10
Nicotine stomatitis	4	0	4	0	2	1	1	0	71.25 ± 7.08	0.05	0.10
Reactive lymphoid hyperplasia	3	1	2	0	0	2	1	0	78.66 ± 4.61	0.04	0.08
Adenomatoid hyperplasia of minor salivary glands	2	1	1	0	2	0	0	0	63.00 ± 4.24	0.03	0.05
Necrotizing sialometaplasia	2	1	1	0	2	0	0	0	63.50 ± 0.70	0.03	0.05
Epstein–Barr virus-positive mucocutaneous ulcer	1	0	1	0	0	0	1	0	89	0.01	0.03
Angina bullosa hemorrhagica	1	0	1	0	1	0	0	0	63	0.01	0.03
Solitary circumscribed neuroma	1	1	0	0	1	0	0	0	60	0.01	0.03
Glandular cheilitis	1	0	1	0	1	0	0	0	69	0.01	0.03
Plasma cell cheilitis	1	0	1	0	0	0	1	0	87	0.01	0.03
Intraoral sebaceous hyperplasia	1	1	0	0	0	0	1	0	82	0.01	0.03
Xanthogranuloma	1	0	1	0	1	0	0	0	68	0.01	0.03
HPV-induced benign proliferative epithelial lesions											
Squamous papilloma	170	61	107	2	101	55	11	3	69.00 ± 7.19	2.27	4.43
Wart	8	4	2	2	3	2	2	1	79.00 ± 10.03	0.11	0.21
Condyloma acuminatum	4	1	3	0	3	1	0	0	64.75 ± 7.12	0.05	0.10
Total (subgroup)	3,84	1,22	2,582	38	2,452	1,091	273	24	68.30 ± 6.87	51.36	100
Cysts											
Inflammatory odontogenic cysts											
Periapical cyst	166	93	70	3	119	36	10	1	67.28 ± 6.72	2.22	34.9
Residual cyst	68	35	33	0	50	13	5	0	67.48 ± 6.16	0.91	14.3
Inflammatory collateral cysts	7	4	3	0	5	2	0	0	66.28 ± 5.31	0.09	1.5
Total (subgroup)	241	132	106	3	174	51	15	1	67.37 ± 6.51	3.22	50.7
Non-inflammatory odontogenic cysts											
Odontogenic keratocyst	68	35	33	0	49	16	2	1	67.13 ± 6.29	0.91	14.3
Odontogenic cyst not otherwise specified	37	23	14	0	18	17	2	0	70.00 ± 6.62	0.49	7.8
Dentigerous cyst	19	10	9	0	13	4	2	0	67.63 ± 6.68	0.25	4.0
Glandular odontogenic cyst	10	4	6	0	9	0	1	0	67.30 ± 7.45	0.13	2.1
Calcifying odontogenic cyst	5	3	2	0	3	2	0	0	69.40 ± 9.28	0.07	1.1
Gingival cyst of adult	4	2	2	0	0	2	2	0	80.25 ± 8.05	0.05	0.8
Lateral periodontal cyst	3	0	3	0	2	1	0	0	66.33+9.23	0.04	0.6
Orthokeratinized odontogenic cyst	2	2	0	0	1	1	0	0	66.00 ± 7.07	0.03	0.4
Total (subgroup)	148	79	69	0	95	43	9	1	68.27 ± 6.95	1.98	31.2
Non-odontogenic cysts											
Bronchogenic cyst	1	0	1	0	1	0	0	0	61	0.01	0.2
Salivary duct cyst	45	15	30	0	25	16	3	1	69.57 ± 7.86	0.60	9.5
Nasopalatine duct cyst	15	8	7	0	11	3	1	0	66.93 ± 5.25	0.20	3.2
Epidermoid cyst	8	4	4	0	4	4	0	0	69.50 ± 6.27	0.11	1.7
Oral lymphoepithelial cyst	7	5	2	0	2	3	2	0	74.00 ± 9.29	0.09	1.5

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Continuation											
Dermoid cyst	5	4	1	0	1	3	1	0	71.60 ± 8.26	0.07	1.1
Nasolabial cyst	4	0	4	0	1	3	0	0	72.00 ± 3.91	0.05	0.8
Thyroglossal duct cyst	1	0	1	0	0	0	1	0	83	0.01	0.2
Total (subgroup)	86	36	50	0	45	32	8	1	69.75 ± 7.48	1.15	18.1
TOTAL (Cysts)	475	247	225	3	314	126	32	3	68.07 ± 6.88	6.35	100
Pigmentated and calcified lesions											
Exogenous pigmentation											
Amalgam tattoo	34	11	23	0	27	6	1	0	66.70 ± 4.96	0.45	29.8
Others	3	2	1	0	2	0	1	0	72.33 ± 10.40	0.04	2.6
Endogenous pigmentation											
Melanotic macule	23	7	16	0	16	6	1	0	66.21 ± 6.36	0.31	20.2
Racial pigmentation	8	2	5	1	4	4	0	0	69.75 ± 6.79	0.11	7.0
Post-inflammatory pigmentation	3	0	3	0	3	0	0	0	64.00 ± 2.64	0.04	2.6
Melanoacanthoma	1	0	1	0	0	0	1	0	81	0.01	0.9
Calcified lesions											
Sialolithiasis/sialolith	42	13	29	0	30	9	3	0	67.30 ± 7.40	0.56	36.8
Total (subgroup)	114	35	78	1	82	25	7	0	67.24 ± 6.58	1.52	100
Non-neoplastic bone lesions											
Fibro-osseous lesions											
Central ossifying fibroma	8	2	5	1	5	3	0	0	68.50 ± 5.97	0.11	12.3
Fibrous dysplasia	4	0	4	0	3	1	0	0	65.25 ± 9.21	0.05	6.2
Cemento-osseous dysplasia											
Florid cemento-osseous dysplasia	17	1	16	0	12	2	3	0	68.52 ± 7.86	0.23	26.2
Focal cemento-osseous dysplasia	14	4	10	0	10	3	1	0	66.92 ± 6.47	0.19	21.5
Periapical cemento-osseous dysplasia	4	1	3	0	4	0	0	0	64.50 ± 4.12	0.05	6.2
Fibro-osseous lesion not otherwise specified	6	2	4	0	4	2	0	0	67.00 ± 5.65	0.08	9.2
Giant cell lesions and pseudocysts											
Central giant cell lesion	9	5	4	0	2	5	2	0	74.44 ± 8.32	0.12	13.8
Simple bone cyst	2	1	1	0	2	0	0	0	67.00 ± 0.00	0.03	3.1
Aneurysmal bone cyst	1	0	1	0	1	0	0	0	63	0.01	1.5
Total (subgroup)	65	16	48	1	43	16	6	0	68.33 ± 7.42	0.87	100
Normal variations and tumor-like malformations											
Vascular malformation	72	30	41	1	38	21	12	1	70.81 ± 8.11	0.96	40.7
Varicose	35	13	22	0	16	14	5	0	71.08 ± 6.60	0.47	19.8
Exostoses and Tori	20	7	13	0	14	6	0	0	66.90 ± 4.10	0.27	11.3
Neurovascular hamartoma	18	6	12	0	11	7	0	0	67.38 ± 4.81	0.24	10.2
Geographic tongue	10	3	6	1	5	3	2	0	70.70 ± 7.70	0.13	5.6
Caliber-persistent labial artery	8	4	4	0	5	3	0	0	69.25 ± 4.16	0.11	4.5
Fordyce spots	4	2	2	0	2	2	0	0	67.25 ± 6.60	0.05	2.3
Subgemmal neurogenous plaque	4	2	2	0	2	1	1	0	71.00 ± 7.95	0.05	2.3

Continue

Continuation

Angiolipomatous hamartoma	1	1	0	0	0	1	0	0	71	0.01	0.6
Cartilaginous choristoma	1	0	1	0	0	1	0	0	72	0.01	0.6
Lipomatous hamartoma	1	0	1	0	1	0	0	0	64	0.01	0.6
Angiomyolipomatous hamartoma	1	1	0	0	1	0	0	0	65	0.01	0.6
Odontogenic epithelial hamartoma	1	1	0	0	1	0	0	0	63	0.01	0.6
Pilous tongue	1	0	1	0	0	1	0	0	79	0.01	0.6
Total (subgroup)	177	70	105	2	96	60	20	1	69.86 ± 6.94	2.37	100
TOTAL	4,852	1,641	3,165	46	3,091	1,376	356	29	68.36 ± 6.89	64.9	100

NI: not informed; [a]Percent in relation to the total number of cases; [b]Percent within the group; [c]Person's chi-square test $p < 0.001$.

Oral potentially malignant disorders were the third most common group of lesions in older adults (n = 759; 10.1%) and mainly included clinically diagnosed lesions such as oral leukoplakia, erythroplakia, and erythroleukoplakia. In these cases, mild epithelial dysplasia (n = 258; 34.0%), moderate dysplasia (n = 153; 20.2%), and severe dysplasia (n = 194; 25.6%) were commonly observed histologically (Table 6).

Regarding cystic lesions, 81.9% (n = 389) were odontogenic cysts and only 18.1% (n = 86) were non-odontogenic cysts. Odontogenic cysts were slightly more common in men (n = 211; 54.7%) with a male-to-female ratio of 1.2:1. On the other hand, non-odontogenic cysts were more common in women (n = 50; 58.1%) with a male-to-female ratio of 1:1.4. Among odontogenic cysts, periapical and residual cysts (n = 234; 49.3%) were the most common types, followed by odontogenic keratocyst (n = 68; 14.3%). Regarding non-odontogenic cysts, salivary duct cyst (n = 45; 9.5%) and nasopalatine duct cyst (n = 15; 3.2%) were the most prevalent in this population (Table 3).

Concerning immunological diseases, oral lichen planus (n = 80; 55.9%), followed by mucous membrane pemphigoid (n = 45; 31.5%) were the most common disorders. Both showed a strong predilection for females, with a female-to-male ratio of 4.3:1 and 3.1:1, respectively (Table 3). Various infectious diseases, pigmented and calcified lesions, non-neoplastic bone lesions, and normal variations of the oral cavity and tumor-like malformations were also found. These lesions exhibited a heterogeneous distribution in older people and are described in detail in Table 3.

The agreement between clinical and histopathologic diagnoses was 55.2% (3,209 of 5,812 cases) for all cases and varied depending on the diagnosis. The highest rate of agreement was related to infectious diseases (82.4%), followed by immunological diseases (67.4%). The lowest rate of agreement was related to cysts (48.7%) and non-neoplastic bone lesions (48.9%) (Table 2).

Discussion

Several studies have reported on the incidence and prevalence of oral lesions in older people,[1,6,7,10,22-27] but many rely solely on clinical diagnosis,[12-19] which can lead to inaccurate findings, as the final diagnosis often requires histopathological analysis, considered the gold standard for diagnosing many diseases.[1] In the present study, the overall agreement between clinical and histopathological diagnoses was only 55.2% (3,209 cases) for all cases and varied depending on the diagnosis (48.7–82.4%) (Table 2). It is important to emphasize that the lack of agreement between clinical and histopathological diagnoses can lead to treatment errors and unfavorable patient outcomes. Therefore, healthcare professionals should adopt the practice of sending all biopsied material for histopathological analysis for a more accurate and appropriate evaluation of the patient's condition.

In the present study, the prevalence of oral and maxillofacial lesions in older adults ranged from 18.8% to 26.5% at the participating centers, similar to that of previous studies.[1,25] However, other studies have shown higher (31.1%)[26] and lower prevalence rates (9.2%–14.9%).[6,10,27] These variations may result from

Table 4. Frequency of malignant neoplasms observed in older people.

Malignant neoplasms	n	Sex			Age				Mean age (± SD)	%a	%b
		Male	Female	NI	60–69	70–79	80–89	≥ 90			
Epithelial and melanocytic tumors											
Squamous cell carcinoma	1,191	746	437	8	582	366	207	36	71.63±8.78	15.93	88.09[a]
Verrucous carcinoma	29	13	16	0	9	9	11	0	74.86±9.23	0.39	2.14
Basal cell carcinoma	19	10	9	0	6	7	5	1	74.57±10.48	0.25	1.41
Sebaceous carcinoma	1	1	0	0	1	0	0	0	62	0.01	0.07
Merkel cell carcinoma	1	1	0	0	0	0	1	0	81	0.01	0.07
Melanoma	5	1	4	0	5	0	0	0	66.80±3.49	0.07	0.37
Total (subgroup)	1,246	772	466	8	603	382	224	37	71.73±8.83	16.67	92.16
Salivary gland tumors											
Mucoepidermoid carcinoma	27	11	16	0	17	8	1	1	68.18±7.49	0.36	2.00
Polymorphous adenocarcinoma	18	5	13	0	8	7	2	1	70.72±8.44	0.24	1.33
Adenoid cystic carcinoma	18	8	9	1	8	7	2	1	72.27±8.81	0.24	1.33
Adenocarcinoma not otherwise specified	8	5	3	0	2	4	2	0	74.37±8.24	0.11	0.59
Acinic cell carcinoma	1	0	1	0	1	0	0	0	61	0.01	0.07
Hyalinizing clear cell carcinoma	1	0	1	0	0	1	0	0	75	0.01	0.07
Secretory carcinoma	1	0	1	0	1	0	0	0	61	0.01	0.07
Carcinoma ex pleomorphic adenoma	1	0	1	0	0	0	1	0	83	0.01	0.07
Total (subgroup)	**75**	**29**	**45**	**1**	**37**	**27**	**8**	**3**	**70.53±8.34**	**1.00**	**5.55**
Hematolymphoid tumors											
Diffuse large B-cell lymphoma	8	3	5	0	4	0	4	0	74.87±8.54	0.11	0.59
Follicular lymphoma	1	0	1	0	1	0	0	0	64	0.01	0.07
CD30-positive T-cell lymphoproliferative disorder	1	0	1	0	1	0	0	0	62	0.01	0.07
ALK-negative anaplastic large cell lymphoma	1	1	0	0	0	0	1	0	88	0.01	0.07
Non-Hodgkin lymphoma	2	0	2	0	1	0	1	0	74.50±16.26	0.03	0.15
Multiple myeloma	1	1	0	0	1	0	0	0	65	0.01	0.07
Solitary plasmacytoma	2	0	2	0	1	1	0	0	70.00±4.24	0.03	0.15
Total (subgroup)	**16**	**5**	**11**	**0**	**9**	**1**	**6**	**0**	**72.93±9.43**	**0.21**	**1.18**
Mesenchymal tumors											
Osteosarcoma	1	1	0	0	0	1	0	0	70	0.01	0.07
Angiosarcoma	1	1	0	0	1	0	0	0	61	0.01	0.07
Leiomyosarcoma	2	0	2	0	0	2	0	0	71.00±1.41	0.03	0.15
Total (subgroup)	**4**	**2**	**2**	**0**	**1**	**3**	**0**	**0**	**68.25±4.92**	**0.05**	**0.3**
Oral metastases											
Intestinal-type adenocarcinoma	1	0	1	0	1	0	0	0	69	0.01	0.001
Ductal breast carcinoma	4	1	3	0	2	1	1	0	73.5±10.14	0.05	0.003
Renal cell carcinoma	3	1	2	0	0	3	0	0	78.66±0.57	0.04	0.002
Prostatic adenocarcinoma	2	2	0	0	1	0	1	0	77.0±11.31	0.03	0.001
Pulmonary adenocarcinoma	1	1	0	0	1	0	0	0	65	0.01	0.001
Total (subgroup)	11	5	6	0	5	4	2	0	73.83±7.89	0.15	0.01
Odontogenic tumors											
Ameloblastic carcinoma	1	1	0	0	1	0	0	0	68	0.01	0.1
Total (subgroup)	1	1	0	0	1	0	0	0	68	0.01	0.1
TOTAL	1,353	814	530	9	656	417	240	40	71.67±8.79	18.1	100

NI: not informed; [a]Percent in relation to the total number of cases; [b]Percent in the group (malignant tumors); [a]Person's chi-square test $p < 0.001$.

Table 5. Frequency of benign neoplasms observed in older people.

Benign neoplasms	n	Sex			Age				Mean age (± SD)	%[a]	%[b]
		Male	Female	NI	60-69	70-79	80-89	≥90			
Odontogenic tumors											
Ameloblastoma	65	29	36	0	31	21	13	0	71.12 ± 7.30	0.87	12.7
Odontoma	6	1	5	0	5	1	0	0	67.33 ± 7.00	0.08	1.2
Adenomatoid odontogenic tumor	3	1	2	0	2	1	0	0	70.00 ± 6.08	0.04	0.6
Odontogenic myxoma	2	0	2	0	1	0	1	0	72.00 ± 12.72	0.03	0.4
Calcifying epithelial odontogenic tumor	2	0	2	0	1	1	0	0	70.50 ± 7.77	0.03	0.4
Central odontogenic fibroma	2	0	2	0	2	0	0	0	63.00 ± 0.00	0.03	0.4
Peripheral odontogenic fibroma	2	0	2	0	1	0	1	0	73.00 ± 9.89	0.03	0.4
Squamous odontogenic tumor	1	0	1	0	1	0	0	0	63	0.01	0.2
Total (subgroup)	83	31	52	0	44	24	15	0	70.75 ± 7.25	1.11	16.2
Salivary gland tumors											
Pleomorphic adenoma	40	16	21	3	24	11	3	2	69.50 ± 8.33	0.54	7.8
Canalicular adenoma	9	2	7	0	7	1	1	0	66.66 ± 8.80	0.12	1.8
Cystadenoma	5	2	3	0	1	2	2	0	76.00 ± 7.07	0.07	1.0
Sialadenoma papilliferum	4	0	4	0	1	3	0	0	71.25 ± 4.92	0.05	0.8
Basal cell adenoma	3	0	3	0	2	1	0	0	69.50 ± 4.94	0.04	0.6
Oncocytoma	1	0	1	0	0	0	1	0	85	0.01	0.2
Myoepithelioma	1	0	1	0	1	0	0	0	63	0.01	0.2
Total (subgroup)	63	20	40	3	36	18	7	2	69.73 ± 8.30	0.84	12.1
Mesenchymal tumors											
Fibroma	146	53	93	0	98	38	10	0	67.76 ± 6.62	1.95	28.5
Lipoma	143	59	84	0	83	44	16	0	69.42 ± 7.01	1.91	27.9
Hemangioma	15	6	9	0	7	5	2	1	71.93 ± 8.85	0.20	2.9
Neurofibroma	10	7	3	0	8	2	0	0	65.90 ± 6.40	0.13	2.0
Giant cell fibroma	21	4	17	0	14	6	0	1	67.66 ± 7.35	0.28	4.1
Lymphangioma	7	4	3	0	3	4	0	0	70.85 ± 4.48	0.09	1.4
Granular cell tumor	6	3	3	0	4	2	0	0	68.16 ± 5.49	0.08	1.2
Solitary fibrous tumor	4	2	2	0	2	2	0	0	67.50 ± 4.20	0.05	0.8
Angioleiomyoma	2	0	2	0	1	1	0	0	67.50 ± 4.94	0.03	0.4
Osteoma	1	0	1	0	1	0	0	0	69	0.01	0.2
Inflammatory myofibroblastic tumor	1	1	0	0	1	0	0	0	63	0.01	0.2
Others tumors											
Melanocytic nevi	6	3	3	0	5	1	0	0	68.50 ± 1.64	0.08	1.2
Nasopharyngeal angiofibroma	2	2	0	0	0	0	2	0	88.50 ± 0.70	0.03	0.4
Sinonasal hemangiopericytoma	1	0	1	0	1	0	0	0	62	0.01	0.2
Angiomyxoma	1	1	0	0	1	0	0	0	62	0.01	0.2
Total (subgroup)	366	145	221	0	229	105	30	2	68.63 ± 6.22	4.9	71.5
TOTAL	512	196	313	3	309	147	52	4	69.10 ± 7.18	6.8	100

NI, not informed; [a]Percent in relation to the total number of cases; [b]Percent in the group (benign tumors).

Table 6. Frequency of oral potentially malignant disorders observed in older people.

Oral potentially malignant disorders	n	Sex			Age				Mean age (± SD)	%[a]	%[b]
		Male	Female	NI	60-69	70-79	80-89	≥90			
Oral erythroplakia, leukoplakia, or erythroleukoplakia											
Mild dysplasia	258	100	156	2	150	68	36	4	69.91 ± 7.95	3.45	34.0
Moderate dysplasia	153	60	93	0	87	43	23	0	69.82 ± 7.96	2.05	20.2
Severe dysplasia	194	101	93	0	102	59	29	4	70.59 ± 8.17	2.59	25.6
No dysplasia	32	9	23	0	20	11	1	0	68.00 ± 6.13	0.43	4.2
Actinic cheilitis	122	92	30	0	72	42	7	1	68.66 ± 6.48	1.63	16.1
Total	759	362	395	2	431	223	96	9	69.78 ± 7.74	10.15	100.0

NI: not informed; [a]Percent in relation to the total number of cases; [b]Percent in the group (oral potentially malignant disorders).

differences in socioeconomic and cultural patterns between different countries or regions of the same country, which influence the habits and diseases of a population.[1] Another factor that could explain the difference in the prevalence of oral lesions observed between the studies is that some describe a country's national profile or representative regions.[1,6] In contrast, others report prevalence rates limited to a single faculty of medicine or dentistry, nursing homes, or institutionalized patients.[7,12,14,18,22]

The prevalence of oral and maxillofacial lesions has increased in older individuals when compared to younger ones.[1,6] With advancing age, the oral lining epithelium becomes thinner, and the underlying connective tissue shows reduced collagen synthesis, fibrotic and degenerative collagen changes, and elastin loss[6]. In addition, reduced immune response, impaired DNA repair capacity, and impaired carcinogenic metabolism make the oral mucosa more permeable to harmful substances and more vulnerable to carcinogenic agents. Therefore, oral lesions tend to develop more frequently and rapidly in aging populations.[6,28] However, age alone is not the only factor contributing to the high prevalence of oral lesions in older people. Other factors such as trauma, systemic diseases, poor nutritional status, use of some medications, poor oral hygiene, and use of ill-fitting dentures may also influence the development of oral lesions.[6]

In Brazil and other developing countries, individuals aged 60 years or older are considered senior citizens; in developed countries, this classification applies to ≥ 65 years.[1] As shown in Table 2, most patients (n = 4,428; 60.0%) were aged between 60 and 69 years, with a mean age of 69.1 years, similar to the findings of previous studies.[1,7,10,13,15,23] The mean age of women and men was also similar, 69.26 ± 7.50 and 68.78 ± 7.44 (± SD), respectively. However, a higher average age has been observed in developed countries and reflects better living conditions and health services.[6]

Most studies assessing the prevalence of oral lesions in older people report a higher frequency in female patients,[1,6,7,12,14,17] as in the present study (59.4%). Some, however, have found a higher prevalence of oral lesions in men.[15,18,19] These differences may be influenced by demographic, geographic, social, and cultural factors,[1] such as the ratio of men and women in a population. For instance, in China, where men represent over 50% of the population, a higher prevalence of oral lesions has been reported in men.[19] Additionally, disparities in healthcare access and utilization between men and women can affect the identification and diagnosis of these lesions. In Brazil, men, especially those from a lower social background, seem to seek medical and dental care less frequently, which can decrease the likelihood of diagnosing possible oral lesions.[1]

Oral lesions occurred on different anatomical sites. The tongue and labial/buccal mucosa were the most affected sites in soft tissues, corresponding to 46.5% of all diagnosed lesions (n = 3,381). On the other hand, intraosseous lesions occurred mainly in the mandible (n = 513; 7.0%). Similar data were

reported in previous studies.[1,6] The reason why the tongue and labial/buccal mucosa are the most common anatomical locations is that the five most commonly diagnosed lesions occur primarily at these anatomical sites (fibrous/fibroepithelial hyperplasia, SCC, epithelial dysplasia, hyperkeratosis/acanthosis, and lichen planus).

In the present study, the three most common oral lesions in older patients were fibrous/fibroepithelial hyperplasia (n = 2,042; 27.3%), SCC (n = 1,191; 15.9%), and epithelial dysplasia (n = 605; 8.1%), data similar to previous biopsy-based studies.[1,6,22] In contrast, in clinical studies, the most prevalent oral lesions were herpetic infection, Fordyce granules, fissured tongue, dry mouth, hairy tongue, red spots, infection-related swellings, traumatic ulcers, denture stomatitis, irritative hyperplasias, and varices.[7,12-17,19,25] This apparent discrepancy among studies is not surprising as many diagnoses can be made based on clinical examination alone and do not require a biopsy. Although our study has higher accuracy because all lesions were histopathologically evaluated, it does not represent the actual prevalence of some lesions routinely diagnosed only by clinical examination.

Several studies show that reactive and inflammatory lesions are the most commonly seen in older individuals.[1,6,22] Just over half of all lesions analyzed in the present study were of a reactional and inflammatory nature (51.3%). This high prevalence of reactive and inflammatory lesions may be associated with the greater use of removable dentures by older patients. This may explain why the alveolar mucosa was one of the most affected sites in the present study. Inflammatory fibrous hyperplasias are usually caused by chronic trauma to the oral mucosa in individuals who wear removable dentures.[1,22] The quality of removable dentures, anatomical factors, and the length of time of removable denture wearing can lead to the development of these lesions. Therefore, health professionals should provide removable denture wearers with proper instructions.[22,29] In addition, seizures, Alzheimer's disease, Parkinson's disease, and other neurodegenerative conditions that are more common in older individuals can also influence the development of these lesions.[1,6,18]

Malignant neoplasms were the second most common group of lesions (29.8%) in this population. In addition, approximately one in five older adults were diagnosed with oral cancer, mainly SCC (83.4%). Oral SCC is the most prevalent oral cancer in older patients.[1,6,7,22] It often develops from potentially malignant disorders, which represent the third most common group of lesions in the present study. The clinical presentation, biological behavior, and prognosis of SCC are variable.[1,30] Treatment and prognosis depend on tumor size at diagnosis, histological grade, presence of metastases, and the patient's general health status.[1] Despite recent advances in the treatment modality, only about 15% to 40% of patients diagnosed with SCC live longer than five years. These data highlight the urgent need to adopt measures to ensure early detection and diagnosis of these lesions so as to reduce morbidity and mortality and alleviate the main complications of cancer treatment, which significantly reduce the quality of life and survival of these patients.[1,6,30]

The precise etiology of oral SCC remains unknown, but predisposing factors, such as smoking associated with alcohol use, are well known.[30,31] Other habits were also associated with oral SCC, such as chewing betel leaves and inverted smoking habit, commonly observed in Asian countries.[30,31] Additional causal factors, such as nutritional deficiencies and DNA oncogenic viruses, have also been suggested.[1,30,31] In the present study, 15.2% (n = 1,138) of the older individuals were smokers; of these, 35.0% (n = 398) had SCC, which is consistent with the findings of another Brazilian multicenter study.[1]

In the European continent, the fact that the incidence and prevalence of oral cancer are high in France, a country with one of the highest alcohol consumption in the world, has led some researchers to suggest that alcohol consumption may be the determining factor in these cases.[18] However, other studies show that alcoholism does not offer a strong association with cases of SCC or potentially malignant disorders.[32,33] Nevertheless, the synergistic effects of alcohol and tobacco consumption on the risk of oral SCC are well established.[30,31] In the assessed sample, few cases had a history of alcohol consumption (n = 127; 1.7%); however, 73 of these

patients (57.5%) had SCC. However, these rates are likely underestimated given the lack of information on smoking and alcohol consumption habits in many clinical records of oral cancer patients. These findings underscore the significance of filling medical records and histopathological examination request forms appropriately, as this is essential for precise diagnosis and evaluation of risk factors for oral cancer development.

Only in studies based on histopathological records can potentially malignant disorders be diagnosed accurately.[6] In the present study, epithelial dysplasia was the most common potentially malignant disorder (Table 6). In clinical studies, this type of lesion is often diagnosed as leukoplakia, erythroplakia, or erythroleukoplakia.[6] Although studies have shown a statistically significant relationship between male sex and the presence of leukoplakia, only smoking habit and being a former smoker were predictive risk factors associated with potentially malignant disorders.[32]

The present study observed a low prevalence of infectious diseases at the three oral pathology centers. Many of these diseases reduce the quality of life and should not be overlooked during a routine clinical examination. Candidiasis was the most common infection (39.5%). Cases of oral candidiasis are not common at oral pathology centers because it is a disease often diagnosed clinically, not requiring histopathological analysis.[1,6,22] In addition, this type of lesion is usually diagnosed in samples sent to microbiology laboratories.[6] Previous biopsy-based studies have also reported a low prevalence of oral infections in older people.[1,6,22]

Interestingly, paracoccidioidomycosis was the second most common infection (34.2%). Paracoccidioidomycosis is a systemic mycosis originally described by Adolfo Lutz in 1908, with the highest incidence recorded in South American countries (Brazil, Argentina, Colombia, and Venezuela). In Brazil, most cases have been reported in the south, southeast, and midwest regions.[34] In the present study, all cases of paracoccidioidomycosis were diagnosed at the oral and maxillofacial pathology center located in Rio de Janeiro (southeastern Brazil), an endemic area of this disease.

Conclusion

In summary, oral lesions, most of them reactional and inflammatory, were highly prevalent in older people followed by malignant neoplasms. Due to the high prevalence of malignant tumors and potentially malignant disorders, geriatricians and dentists should perform a thorough periodic oral examination for early detection of these lesions to reduce morbidity and mortality, contributing to a better quality of life. In addition, these professionals should use strategies for helping these patients eliminate risk factors, especially smoking and alcohol consumption, thus acquiring a healthy lifestyle. In addition, the moderate agreement observed between the clinical and histopathological diagnoses reinforces the importance of histopathological analysis of all biopsy material. This practice is essential, considering that clinical evaluations alone may not be sufficient to obtain an accurate diagnosis.

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