Original Article

JOMP Journal of Oral Medicine and Pain

eISSN 2383-8493
J Oral Med Pain 2022;47(3):109-116
https://doi.org/10.14476/jomp.2022.47.3.109

Clinical Characteristics and Distribution of the Tongue-Related Diagnoses of Patients with Tongue Symptoms

Jae-Man Park[1] | Ji Hoo Kim[2] | Hyun-Jeong Park[3] | Jong-Mo Ahn[3]

[1]Department of Dentistry, Graduate School, Chosun University, Gwangju, Korea
[2]Department of Oral Medicine, Chosun University Dental Hopital, Gwangju, Korea
[3]Department of Oral Medicine, School of Dentistry, Chosun University, Gwangju, Korea

Received July 21, 2022
Revised August 29, 2022
Accepted September 5, 2022

Correspondence to:
Jong-Mo Ahn
Department of Oral Medicine, School of Dentistry, Chosun Univrstity, 309 Pilmun-daero, Dong-gu, Gwangju 61452, Korea
Tel: +82-62-220-3896
Fax: +82-62-234-2119
E-mail: jmahn@chousn.ac.kr
https://orcid.org/0000-0002-3615-3688

This study was supported by research funding from Chosun University Dental Hospital in 2022.

Purpose: This study was conducted to analyze the clinical characteristics and distribution of the tongue-related diagnoses in patients with tongue symptoms.

Methods: The subjects were patients who visited Chosun University Dental Hospital with tongue symptoms from January 1, 2021, to December 31, 2021. We analyzed 491 patients (139 males and 352 females) with tongue-related diagnostic code names in the Korean Standard Classification of Disease (KCD) in the Electronic Medical Record (Dentopinformation Technology Co., Seoul, Korea).

Results: On analyzing the diagnoses of tongue diseases using the KCD, glossopyrosis (44.8%) and painful tongue (15.2%) showed high rates. Of the 491 patients, 139 (28.3%) were males and 352 (71.7%) were females, and the average age was 58.1 years. As for systemic diseases, there were many patients with diseases of the circulatory system (27.0%) and endocrine, nutritional, and metabolic diseases (13.7%). Tongue symptoms were discomfort in 58 patients, pain in 329 patients, paresthesia in 10 patients, burning sensations in 222 patients, dysgeusia in 25 patients, dryness in 110 patients, fissures in 57 patients, and other symptoms in 72 patients. Areas with tongue symptoms were the anterior area in 102 patients, the lateral area in 140 patients, the posterior area in 12 patients, the dorsal area in 140 patients, the ventral area in 42 patients, and which area in 126 patients overall. Patients with burning mouth syndrome and oral candidiasis had significantly more tongue symptoms.

Conclusions: Patients with tongue symptoms exhibited a variety of tongue diseases. Tongue symptoms were more common in women over 50 years of age and were frequently seen in patients with burning mouth syndrome and oral candidiasis.

Keywords: Burning mouth syndrome; Oral candidiasis; Tongue symptoms

INTRODUCTION

The tongue, which is called the mirror of the digestive system, is relatively easy to observe. It is also an important organ that provides useful information about the patient's general health status. The tongue is the most active and sensitive tissue among various tissues in the oral cavity. It has taste buds for gustation and plays an important role in food intake, mastication, swallowing, and speech movements. It also helps to maintain the position of the teeth against the pressure of the lips and cheeks [1].

The tongue, which is formed during the development of the outside of the face at 4-6 weeks of gestation, is a muscular organ composed of the extrinsic muscles of the tongue involved in movement and the intrinsic muscles that deform its shape. Since only one end of the tongue is

attached to the bone and many muscles intersect intricately, the shape and size of the tongue can be quickly changed freely, and its muscles can be exercised. The movement of the tongue is controlled by proprioceptive reflexes since there are muscle spindles in the lingual muscles. These muscles are suitable for rapid exercises rather than exercises in which tension is maintained [2].

The tongue can be easily examined; however, thorough anamnesis and physical examination are required by the dentist to detect abnormal findings. Diseases of the tongue are very diverse, and Mangold et al. [3] identified vascular and lymphatic lesions, reactive and inflammatory processes, infections, premalignant lesions, malignant lesions, and signs of systemic disease as lingual medical conditions in a literature review.

Common tongue diseases include developmental anomalies such as microglossia, macroglossia, ankyloglossia, bifid tongue, and geographic tongue, black hairy tongue, fissured tongue, benign migratory glossitis, varices, herpes simplex, and varicella-zoster virus infections, ulcerations, leukoplakia, oral lichen planus, candidiasis, and many more. Benign and malignant tumors such as fibroma and squamous cell carcinoma (SCC) also occur, and tongue coating, fissured tongue, and glossodynia are common lingual conditions and symptoms that are frequently encountered clinically [2].

The tongue is an important organ in the oral cavity, and various diseases of this organ occur due to local or systemic causes. However, studies on patients with tongue symptoms are rare. Thus, this study was conducted to analyze the clinical characteristics and distribution of tongue-related diagnoses of patients with tongue symptoms.

Table 1. Classification of diagnosis of tongue disease

Code	Diseases by KCD-8, 2021	Patients
C01C	Malignant neoplasm of posterior third of tongue	1 (0.2)
C02.1A	Malignant neoplasm of border of tongue	2 (0.4)
C02.2B	Malignant neoplasm of anterior two-thirds of tongue, ventral surface	2 (0.4)
C02.9	Malignant neoplasm of tongue, unspecified	6 (1.2)
D10.1A	Benign neoplasm of tongue	35 (7.1)
K13.2A	Leukoplakia and other disturbances of oral epithelium, including tongue	27 (5.5)
K13.2B	Erythroplakia of oral epithelium, including tongue	2 (0.4)
K13.5B	Submucous fibrosis of tongue	1 (0.2)
K14.0A	Glossitis	4 (0.8)
K14.0B	Abscess of tongue	3 (0.6)
K14.0C	Ulceration (traumatic) of tongue	20 (4.1)
K14.1A	Geographic tongue	9 (1.8)
K14.2	Median rhomboid glossitis	3 (0.6)
K14.3A	Hypertrophy of tongue papillae	15 (3.1)
K14.3B	Black hairy tongue	1 (0.2)
K14.3C	Coated tongue	1 (0.2)
K14.4A	Atrophy of tongue papillae	1 (0.2)
K14.5A	Plicated tongue	17 (3.5)
K14.5B	Fissured tongue	9 (1.8)
K14.6B	Glossopyrosis	220 (44.8)
K14.6C	Painful tongue	75 (15.3)
K14.8A	Other diseases of tongue	4 (0.8)
K14.8B	Atrophy (of) tongue	2 (0.4)
K14.8C	Crenated (of) tongue	2 (0.4)
K14.9A	Disease of tongue, unspecified	3 (0.6)
Q38.1B	Tongue tie	7 (1.4)
S01.53	Open wound of tongue and floor of mouth	19 (3.9)
Total		491 (100.0)

KCD, Korean Standard Classification of Diseases.
Values are presented as number (%).

MATERIALS AND METHODS

1. Study Subjects

The subjects were patients who visited Chosun University Dental Hospital with tongue symptoms from January 1, 2021, to December 31, 2021. Four hundred and ninety-one patients (139 males and 352 females) with diagnostic codes related to the tongue using the 'Korean Standard Classification of Disease (KCD)-8, 2021, Statistics Korea' on the Electronic Medical Record (EMR; Dentopinformation Technology Co., Seoul, Korea) 352 were analyzed (Table 1). According to age, the subjects were classified into (1) those less than 20 years old, (2) those aged at least 20 years and less than 30 years, (3) those aged at least 30 years and less than 40 years, (4) those aged at least 40 years and less than 50 years, (5) those aged at least 50 years and less than 60 years, (6) those aged at least 60 years and less than 70 years, (7) those aged at least 70 years and less than 80 years, and (8) those aged at least 80 years (Table 2). This study was conducted with the approval of the Institutional Review Board of Chosun University Dental Hospital (CUDH1RB-2201-001), and the need for collecting written informed consent was waived by the committee.

Table 2. Distribution according to sex and age group

Age group	Male	Female	Total	p-value (female% CI)
<20 y	20 (14.4)	14 (4.0)	34 (6.9)	0.39 (25.1-59.2)[a]
20-29 y	3 (2.2)	5 (1.4)	8 (1.6)	0.72 (10.2-74.1)[a]
30-39 y	11 (7.9)	18 (5.1)	29 (5.9)	0.27 (21.3-57.6)[a]
40-49 y	17 (12.2)	27 (7.7)	44 (9.0)	0.17 (24.7-54.5)[a]
50-59 y	15 (10.8)	79 (22.4)	94 (19.1)	0.00* (74.7-90.5)[a]
60-69 y	33 (23.7)	113 (32.1)	146 (29.7)	0.00* (69.6-83.7)[a]
70-79 y	24 (17.3)	65 (18.5)	89 (18.1)	0.00* (62.4-81.6)[a]
≥80 y	16 (11.5)	31 (8.8)	47 (9.6)	0.04* (50.6-78.7)[a]
Total	139 (28.3)	352 (71.7)	491 (100.0)	0.00* (67.4-75.6)[a]
Mean age (y)	53.54±23.74	59.90±16.79	58.10±19.24	0.002*[b]

Female% CI, 95% confidence interval of female %.
Values are presented as number (%) or mean±standard deviation.
Results were obtained using the one-sample proportion test (a) and the two-sample z test (b).
*p-values were considered statistically significant when they were less than 0.05.

Table 3. Distribution of systemic diseases

Code	Systemic disease by KCD-8, 2021	Patients	95% CI
N/S	Non-specific symptoms and signs	160 (21.7)	18.8-24.9
I	Certain infectious and parasitic diseases	2 (0.3)	0.0-1.1
II	Neoplasms	32 (4.3)	3.0-6.1
III	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	6 (0.8)	0.3-1.9
IV	Endocrine, nutritional and metabolic diseases	101 (13.7)	11.3-16.4
V	Mental and behavioural disorders	23 (3.1)	2.0-4.7
VI	Diseases of the nervous system	26 (3.5)	2.4-5.2
VII	Diseases of the eye and adnexa	3 (0.4)	0.1-1.3
VIII	Diseases of the ear and mastoid process	9 (1.2)	0.6-2.4
IX	Diseases of the circulatory system	199 (27.0)	23.8-30.3
X	Diseases of the respiratory system	18 (2.4)	1.5-3.9
XI	Diseases of the digestive system	60 (8.1)	6.3-10.4
XII	Diseases of the skin and subcutaneous tissue	10 (1.4)	0.7-2.6
XIII	Diseases of the musculoskeletal system and connective tissue	71 (9.6)	7.6-12.0
XIV	Diseases of the genitourinary system	18 (2.4)	1.5-3.9

KCD, Korean Standard Classification of Diseases; 95% CI, 95% confidence interval of the population ratio.
Values are presented as number (%).

2. Study Methods

Based on the medical records of the patients included in the study, the classification of the diagnoses of tongue diseases by the KCD, the distribution according to sex and age group, the distribution of systemic diseases, characteristics of the tongue symptoms, area of the tongue symptoms, and the classification of clinical diagnoses of the tongue symptoms were investigated.

1) Distribution of systemic diseases

Systemic diseases were classified based on the KCD classification, and patients with multiple systemic diseases were also included in the survey (Table 3).

2) Characteristics of the tongue symptoms

Tongue symptoms were classified into tongue discomfort, pain, paresthesia, dysesthesia, anesthesia, burning sensations, dysgeusia, dryness, fissures, and others. Cases with two or more symptoms were also investigated as multiples (Table 4).

Table 4. Characteristics of the tongue symptoms

Symptoms	Patients	95% CI
Tongue discomfort	58	5.1-8.5
Pain	329	34.1-40.6
Paresthesia	10	0.6-2.1
Anesthesia	0	0.0-0.5
Burning sensation	222	22.3-28.2
Dysgeusia	25	1.9-4.2
Dryness	110	10.4-14.9
Fissure	57	5.0-8.3
Others	72	6.5-10.2

95% CI, 95% confidence interval of population ratio.
Values are presented as number only.

Table 5. Area with tongue symptoms

Sites	Patients	95% CI
Anterior	102	15.1-21.6
Lateral	140	21.4-28.7
Posterior	12	1.2-3.8
Dorsal	140	21.4-28.7
Ventral	42	5.5-10.0
Overall	126	19.1-26.1

95% CI, 95% confidence interval of population ratio.
Values are presented as number only.

3) Areas with tongue symptoms

Areas with tongue symptoms were investigated. The anterior part, including the tip of the tongue, and the lateral, posterior, dorsal, ventral, and overall areas, were classified into six regions, and multiple investigations were performed. There was no distinction between the left and right sides (Table 5).

4) Classification of clinical diagnoses based on tongue symptoms

The clinical diagnoses made by patients' doctors based on tongue symptoms were again classified into malignant neoplasms, benign neoplasms, leukoplakia, ulcerations, fissured tongue, geographic tongue, median rhomboid glossitis, burning mouth syndrome, ankyloglossia, oral lichen planus, candidiasis, and others (uncertain) based on EMR analyses.

Cases with more than two clinical diagnoses were also investigated as multiples (Table 6).

3. Statistical Analysis

As shown in Table 1, descriptive statistics were used to classify the diagnoses of tongue diseases. Comparisons between the different sexes and age groups were performed

Table 6. Classification of clinical diagnoses based on tongue symptoms

Diagnostic name	Patients	Value of tongue symptoms
a. Malignant neoplasm	15	1.07±0.258
b. Benign neoplasm	33	1.06±0.242
c. Leukoplakia	17	1.00±0.000
d. Ulcerations	42	1.38±0.492
e. Fissured tongue	29	2.03±0.865
f. Geographic tongue	9	1.22±0.441
g. Median rhomboid glossitis	6	1.00±0.000
h. Burning mouth syndrome	287	2.13±0.878
i. Ankyloglossia	5	1.40±0.548
j. Oral lichen planus	16	1.19±0.403
k. Candidiasis	148	2.21±0.905
l. Others	32	1.28±0.523
F		17.483
p-value		<0.001
Post-hoc		h, k>a, b, c, d, j

Values are presented as number only or mean±standard deviation.
Results were obtained by scoring numbers in Table 4 to obtain the mean and standard deviation, and using one-way ANOVA.
p-values were considered statistically significant when they were less than 0.05.

using the one-sample proportion test and the two-sample z-test as shown in Table 2. The clinical diagnoses of the tongue symptoms were classified using the one-way ANOVA test followed by the Scheffe post hoc test. All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 22.0 (IBM Co., Armonk, NY, USA).

RESULTS

1. Classification of Diagnoses of Tongue Diseases by the Korean Standard Classification of Disease

Per the KCD classification, glossopyrosis (44.8%), painful tongue (15.2%), benign neoplasms of the tongue (7.1%), leukoplakia and other disturbances of the oral epithelium, including the tongue (5.6%), ulceration (traumatic) of the tongue (4.1%), open wound of the tongue and floor of the mouth (3.9%), geographic tongue (1.8%), fissured tongue (1.8%), tongue tie (1.4%), malignant neoplasms of the tongue, unspecified diagnoses (1.2%), etc., appeared in the order of percentage (Table 1).

2. Distribution According to Sex and Age Group

A total of 34 (6.9%) participants were less than 20 years old, 8 (1.6%) were aged 20-29 years, 29 (5.9%) were aged 30-39 years, 44 (9.0%) were aged 40-49 years, 94 (19.1%) were aged 50-59 years, 146 (29.7%) were aged 60-69 years, 89 (18.1%) were aged 70-79 years, and 47 (9.6%) were aged over 80 years.

Of the 491 patients, 139 (28.3%) were males and 352 (71.7%) were females, and the average age of our participants was 58.1 years (Table 2). There were significantly more tongue symptoms in women over 50 years of age ($p<0.05$).

3. Distribution of Systemic Diseases

On investigating the distribution and ratio, we found that there were 14 systemic diseases.

There were two patients with certain infections and parasitic diseases (0.3%), 32 patients with neoplasms (4.3%), 6 patients with diseases of the blood and blood-forming organs and certain disorders involving immune mechanisms (0.8%), 101 patients with endocrine, nutritional, and metabolic diseases (13.7%), 23 patients with mental and behavioral disorders (3.1%), 26 patients with diseases of the nervous system (3.5%), 3 patients with diseases of the eye and adnexa (0.4%), 9 patients with diseases of the ear and mastoid process (1.2%), 199 patients with diseases of the circulatory system (27.0%), 18 patients with diseases of the respiratory system (2.4%), 60 patients with diseases of the digestive system (8.1%), 10 patients with diseases of the skin and subcutaneous tissues (1.4%), 71 patients with diseases of the musculoskeletal system and connective tissues (9.6%), and 18 patients with diseases of the genitourinary system (2.4%) (Table 3).

4. Characteristics of Tongue Symptoms

There were 58 patients with tongue discomfort, 329 patients with pain, 10 patients with paresthesia, 222 patients with burning sensations, 25 patients with dysgeusia, 110 patients with dryness, 57 patients with fissures, and 72 patients with other symptoms (Table 4).

5. Area with Tongue Symptoms

Areas with tongue symptoms were the anterior (102), lateral (140), posterior (12), dorsal (140), ventral (24), and overall (126) (Table 5).

6. Classification of Clinical Diagnoses Based on Tongue Symptoms

The clinical diagnoses of patients with tongue symptoms were distributed as follows: there were 15 patients with malignant neoplasms, 33 patients with benign neoplasms, 17 patients with leukoplakia, 42 patients with ulcerations, 29 patients with fissured tongue, 9 patients with geographic tongue, 6 patients with median rhomboid glossitis, 287 patients with burning mouth syndrome, 5 patients with ankyloglossia, 16 patients with oral lichen planus, 148 patients with candidiasis, and 32 patients with other lingual conditions (uncertain). Patients with burning mouth syndrome and oral candidiasis had significantly more tongue symptoms than other patients ($p<0.05$).

DISCUSSION

The tongue, which can exhibit symptoms related to systemic diseases, is a complex organ that contributes to

pronunciation, taste, mastication, and swallowing. In patients complaining of symptoms, lesions may be observed on the tongue, or normal findings that do not require treatment may be present. Dentists can easily examine the tongue; however, diagnosis and treatment can be difficult. When making a diagnosis, it is necessary to conduct thorough anamnesis, including the time of onset, duration, antecedent symptoms, smoking, and drinking. A careful evaluation of the shape of the tongue is also important [4]. During oral examinations, various diseases, including bullous, ulcerative, atrophic, and cystic disorders of the tongue, should be differentially diagnosed, and benign and malignant lesions may also need to be identified [5].

Burning mouth syndrome is mainly related to the tongue and complaints of burning; however, the tongue often shows normal findings [6]. Median rhomboid glossitis is commonly associated with candida infection, and atrophic glossitis is associated with iron, folic acid, riboflavin, and vitamin B12 deficiency. Geographic tongue and fissured tongue are common tongue conditions encountered by dentists that do not require treatment. Biopsies are required for benign lesions of the tongue such as fibromas, premalignant lesions, such as leukoplakia, and malignant lesions such as SCC [2,4].

In this study, glossopyrosis, painful tongue, benign and malignant neoplasms, leukoplakia ulceration (traumatic) of the tongue, open wounds of the tongue, plicated tongue, fissured tongue, geographic tongue, glossitis, etc., were frequent in the KCD classification of tongue diseases. It was found that tongue symptoms were frequently expressed in women aged over 50 years. Tongue symptoms seem to occur frequently in association with menopausal symptoms in women.

Like the face, the tongue can provide valuable clues in the diagnosis of systemic diseases. In the examination of the tongue, the state of the body's fluid balance can be known by how hydrated the tongue is, and nutritional disorders can be identified by the atrophy of the lingual papillae. Tongue coatings appear in febrile and digestive disorders, and tongue ulcers may be associated with syphilis or pulmonary tuberculosis [7,8]. Lingual changes such as glossitis appear in patients with blood diseases, and these changes can also be observed in immune diseases. In endocrine diseases, the enlargement of the tongue may be seen, and metastatic lesions may appear on the tongue due to neoplastic changes [9]. Vörös-Balog et al. [10] reported the relationship between the prevalence of tongue lesions and various systemic diseases. As a result, the prevalence of tongue lesions was 29.0% in diabetes mellitus, 28.6% in hypertension, 23.9% in liver disease, 22.4% in gastrointestinal disorders, 25.2% in heart and vascular diseases, and 20.7% in cancer.

In this study, systemic diseases such as diseases of the circulatory system, endocrine diseases, nutritional and metabolic diseases, diseases of the musculoskeletal system and connective tissues, diseases of the digestive system, and neoplasms showed a high rate. It is thought that diseases of the circulatory system and endocrine, nutritional and metabolic diseases occurred more frequently than other systemic diseases due to common adult diseases such as hypertension and diabetes mellitus. The long-term use of antihypertensive drugs can cause oral candidiasis associated with dry mouth, and diabetes mellitus can cause discomfort and abnormal sensations in the oral cavity.

Taste and general sensations of the tongue are ensured by facial and trigeminal nerve innervation in the anterior two-thirds, and by the glossopharyngeal nerve in the posterior one-third of the tongue. The sublingual nerve dominates the movement of the entire tongue, and the glossopharyngeal nerve and the vagus nerve are responsible for the tip of the tongue and the throat area. The surface of the tongue is continuous with the oral mucosa, and the lower surface is smooth; however, the upper surface, that is, the dorsal surface, is rough due to the presence of the lingual papillae and lingual tonsils. There are four types of lingual papillae: the circumvallate papillae that are arranged in an inverted V-shape on the posterior part of the back of the tongue, the foliate papillae that are composed of folds perpendicular, horizontal, or intersecting to the mucosa along the side of the molar area, the fungiform papillae that are distributed over the front of the dorsal surface of the tongue in a mushroom shape, and the filiform papillae that are uniformly distributed on the dorsal surface with tongue-shaped fine projections [2].

The tongue symptoms expressed due to these anatomical features of the tongue were varied. Pain, burning

sensations, and dryness were frequent, and symptoms such as tongue discomfort, fissures, dysgeusia, and paresthesia occurred. Patients with tongue symptoms in the lateral and dorsal areas were many, in the order of the entire tongue, anterior, ventral, and posterior areas. These results are considered to be related to the high prevalence of glossopyrosis and painful tongue in the diagnoses of tongue diseases using the KCD.

The names of diagnoses in the KCD do not include all disease names used clinically. Therefore, Table 6 was reclassified with the final diagnoses made by clinicians. In the classification of clinical diagnoses of patients with tongue symptoms, burning mouth syndrome, and candidiasis were the most frequent, followed by ulcerations, benign neoplasms, fissured tongue, leukoplakia, oral lichen planus, malignant neoplasms, geographic tongue, median rhomboid glossitis, ankyloglossia, etc.

Burning mouth syndrome is a disease characterized by burning pain in the tongue or oral mucosa without specific tissue changes in the symptomatic area. A burning sensation appears, in chronological order, in the tongue, alveolar mucosa, palate, and buccal mucosa, accompanied by dry mouth and taste abnormalities. Burning mouth syndrome lasts for at least 4-6 months, and because the burning sensation mainly appears on the tongue, terms such as glossodynia, glossopyrosis, and glossalgia have also been used. Burning mouth syndrome mainly occurs in patients with an average age of 55-60 years, and the male-to-female ratio is 1:3; also, it is predominant in females [6,11,12]. In this study, burning mouth syndrome occurred most frequently in women with an average age of 58.1 years, and was the most common clinical diagnosis in patients with tongue symptoms after 30 years of age.

Candidiasis, the most common fungal infection, is caused by candida albicans, a part of the normal oral flora. Candida albicans is particularly abundant in the posterior part of the tongue and characteristically forms a colony on the mucosal surface. This colony can be a channel for penetration into deeper tissues when the host's immunity is compromised [13]. Acute candidiasis includes pseudomembranous and atrophic candidiasis, and chronic candidiasis includes hyperplastic and atrophic candidiasis. Angular cheilitis and median rhomboid glossitis also result from candida infection. The prevalence of candidiasis is increased in dry mouth, broad-spectrum antibiotic and corticosteroid use, night denture use, smoking, infants, and immunocompromised patients [14,15]. The patient complains of a burning mouth, dysphasia, dysgeusia, and anorexia [16]. The incidence of oral candidiasis is increasing with the recent increase in the elderly population; so, it is considered important to recognize oral candidiasis in the elderly [17]. In this study, oral candidiasis showed the second highest prevalence rate after burning mouth syndrome.

Ulceration occurs as a result of defects in the superficial epithelium or underlying connective tissue of the oral mucosa. Acute ulcers do not last longer than two weeks, even with a history of relapse, and are typically painful [18]. Chronic ulcers last longer than 2 weeks and reflect early symptoms of malignancy. The most common malignant tumor of oral epithelial origin is SCC, which mainly occurs on the ventral and lateral borders of the tongue, the floor of the mouth, and the lower lip [19]. Most ulcerative lesions of SCC are solitary; however, multiple ulcerations may be present [20]. Ulcers are frequently caused by viral, bacterial, and fungal infections, and tongue ulcers caused by herpes simplex virus infection and candidiasis are commonly observed. Although uncommon, tongue ulcers caused by *Mycobacterium tuberculosis* and *Treponema pallidum* may also be seen in patients with tuberculosis and syphilis [18,21,22].

Immune-related recurrent aphthous ulceration and erosive lichen planus also commonly present as ulcerative lesions of the tongue, and can also be seen in patients with leukemia and inflammatory bowel disease [23-26]. Trauma affecting the oral mucosa can characteristically result in superficial ulceration, which is one of the most common oral ulcerations [27]. As such, there are various factors that cause tongue ulcers, and in this study, ulcers were identified as the third most common clinical diagnosis in patients with tongue symptoms.

Tongue diseases are diverse, and benign neoplasms (such as fibromas), geographic tongue that changes the color and shape of the tongue, tongue coating, and fissured tongue may or may not be associated with tongue discomfort [28-30]. Fibromas are benign tumors of fibrous connective tissues, and they usually occur mainly in the tongue and

buccal mucosa, asymptomatically, due to the proliferation of connective tissues in response to trauma and stimulation [28]. The degree of the tongue coating varies from person to person and depends on the oral environment; however, it increases with age. The tongue coating on the dorsal surface of the tongue, which is composed of exfoliated keratin, foliate papillae and food debris deposited between them, oral microorganisms, etc., is often associated with systemic diseases such as gastrointestinal disorders [29]. Geographic tongue is related to a decrease in the levels of the keratinase enzyme (although the underlying cause is unclear) and its shape changes over time. Fissured tongue is the most common of the developmental anomalies of the tongue, and there may be slight pain due to the inflammation of food residues in the fissured part; however, it has no pathological significance and is sometimes accompanied by a geographic tongue [2,30]. Various diseases, such as benign neoplasms, fissured tongue, leukoplakia, oral lichen planus, malignant neoplasms, geographic tongue, median rhomboid glossitis, and ankyloglossia, were investigated in relation to tongue symptoms in this study. It was difficult to compare our findings to those of other studies because similar studies are rare at the moment.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. du Toit DF. The tongue: structure and function relevant to disease and oral health. SADJ 2003;58:375-376, 380-383.
2. Lee SW, Kim JY, Jung SC, et al. Oral diagnosis. 4th ed. Seoul: Gomunsa; 1990. pp. 325-345.
3. Mangold AR, Torgerson RR, Rogers RS 3rd. Diseases of the tongue. Clin Dermatol 2016;34:458-469.
4. Powell FC. Glossodynia and other disorders of the tongue. Dermatol Clin 1987;5:687-693.
5. Reamy BV, Derby R, Bunt CW. Common tongue conditions in primary care. Am Fam Physician 2010;81:627-634.
6. Choi JK, Hur YK. Taste detection thresholds in burning mouth syndrome. J Oral Med Pain 2004;29:127-133.
7. Byrd JA, Bruce AJ, Rogers RS 3rd. Glossitis and other tongue disorders. Dermatol Clin 2003;21:123-134.
8. Sundararajan D, Noonan V, Gallagher G. Coated tongue. J Mass Dent Soc 2016;65:39.
9. Gaddey HL. Oral manifestations of systemic disease. Gen Dent 2017;65:23-29.
10. Vörös-Balog T, Dombi C, Vincze N, Bánóczy J. [Epidemiologic survey of tongue lesions and analysis of the etiologic factors involved]. Fogorv Sz 1999;92:157-163. Hungarian.
11. Ko MY, Jang YS, Heo JY, Ahn YW. A study on the taste of burning mouth syndrome patients. J Oral Med Pain 2006;31:275-281.
12. Lim HD, Kang JK, Lee YM. A review of etiopathogenesis of burning mouth syndrome. J Oral Med Pain 2010;35:41-47.
13. Korean Academy of Orofacial Pain and Oral Medicine. Diagnosis and treatment of oral soft tissue disease. Seoul: Shinhung International; 2010. pp. 13-137.
14. Kim JH, Ahn JM. Clinical characteristics of patients with oral candidiasis. J Oral Med Pain 2021;46:33-40.
15. Millsop JW, Fazel N. Oral candidiasis. Clin Dermatol 2016;34:487-494.
16. Sharon V, Fazel N. Oral candidiasis and angular cheilitis. Dermatol Ther 2010;23:230-242.
17. Sakaguchi H. [Treatment and prevention of oral candidiasis in elderly patients]. Med Mycol J 2017;58:J43-J49. Japanese.
18. Minhas S, Sajjad A, Kashif M, Taj F, Waddani HA, Khurshid Z. Oral ulcers presentation in systemic diseases: an update. Open Access Maced J Med Sci 2019;7:3341-3347.
19. Bagan J, Sarrion G, Jimenez Y. Oral cancer: clinical features. Oral Oncol 2010;46:414-417.
20. Ghoshal S, Mallick I, Panda N, Sharma SC. Carcinoma of the buccal mucosa: analysis of clinical presentation, outcome and prognostic factors. Oral Oncol 2006;42:533-539.
21. Ajay GN, Laxmikanth C, Prashanth SK. Tuberculous ulcer of tongue with oral complications of oral antituberculosis therapy. Indian J Dent Res 2006;17:87-90.
22. Ramoni S, Cusini M, Gaiani F, Crosti C. Syphilitic chancres of the mouth: three cases. Acta Derm Venereol 2009;89:648-649.
23. Liang MW, Neoh CY. Oral aphthosis: management gaps and recent advances. Ann Acad Med Singap 2012;41:463-470.
24. Di Stasio D, Guida A, Salerno C, et al. Oral lichen planus: a narrative review. Front Biosci (Elite Ed) 2014;6:370-376.
25. Porter SR, Leao JC. Review article: oral ulcers and its relevance to systemic disorders. Aliment Pharmacol Ther 2005;21:295-306.
26. Pereira MS, Munerato MC. Oral manifestations of inflammatory bowel diseases: two case reports. Clin Med Res 2016;14:46-52.
27. Mortazavi H, Safi Y, Baharvand M, Rahmani S. Diagnostic features of common oral ulcerative lesions: an updated decision tree. Int J Dent 2016;2016:7278925.
28. Valério RA, de Queiroz AM, Romualdo PC, Brentegani LG, de Paula-Silva FW. Mucocele and fibroma: treatment and clinical features for differential diagnosis. Braz Dent J 2013;24:537-541.
29. Seerangaiyan K, Jüch F, Winkel EG. Tongue coating: its characteristics and role in intra-oral halitosis and general health-a review. J Breath Res 2018;12:034001.
30. Dudko A, Kurnatowska AJ, Kurnatowski P. Prevalence of fungi in cases of geographical and fissured tongue. Ann Parasitol 2013;59:113-117.