

# The spectrum and frequency of histopathological diagnosis of oral diseases in Oslo: Implications to oral pathology syllabus

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## Abstract

**Introduction:** To assure knowledge and skills in diagnostic work of oral diseases a continuously updated curriculum is essential. The first aim of the present study was to evaluate the spectrum and frequency of oral histopathological diagnoses signed out by oral pathologists at the Department of Pathology, Oslo University Hospital (OUS), Norway during a two-year period. The second aim was to compare the spectrum of histopathological diagnoses with the content of the current syllabus in oral pathology at the Faculty of Dentistry, University of Oslo (UiO).

**Materials and Methods:** In this retrospective cross-sectional study, all histological diagnosis signed out during 2015 and 2016 were included. All histopathological reports were analysed with regard to clinical information and histopathological diagnosis. The spectrum of histopathological diagnoses was compared to the diagnoses presented in lectures and courses for dental and dental hygienist students at UiO.

**Results:** Three thousand four hundred and two histopathological reports (47% males and 53% females) were included. The diagnoses were categorised into eight disease groups and the three most frequent disease groups were cysts, benign tumours/reactive lesions, and white, red, ulcerative and vesiculobullous lesions. The lateral periodontal cyst was more frequent than expected.

**Conclusions:** We conclude that a minor revision of the syllabus is needed, although the most frequent oral conditions presented in this study are well covered in the oral pathology teaching in Oslo. A more clinical related teaching approach should be considered by categorising oral diseases according to, for example location and age groups.

## KEYWORDS

curriculum, dental education, histological diagnosis, jaw cysts, lateral periodontal cyst, Oral pathology

## 1 | INTRODUCTION

To prepare dental professionals with knowledge and skills on diagnostic work and treatment of oral diseases a continuously updated curricula is essential.

Oral pathology refers to diseases of the oral cavity, jaws and salivary glands and serves as a bridge between dentistry, pathology and medicine. Currently, the syllabus in oral pathology at the Faculty of Dentistry, University of Oslo (UiO), follows the guidelines recommended by the Scandinavian Fellowship for Oral Pathology

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and Oral Medicine as well as English and American oral pathology textbooks.<sup>1,2,3,4</sup> However, in order to make a clinically relevant oral pathology syllabus for dental and dental hygienist students, an overview on the frequency of oral pathological diagnoses and the distribution of specific diagnoses into disease groups is needed. In Norway, national registration of oral diseases has mainly been done for dental caries and periodontal diseases due to their high incidence rates. In addition, malignant tumours are registered by the Norwegian Cancer registry.<sup>5</sup> When oral diseases other than caries and periodontal diseases have been investigated in Norway, studies have focused on particular diseases or groups of diseases and not on the spectrum of oral diseases. Thereby, a significant number of diseases/conditions in the oral cavity are rarely or never reported.

The first aim of the present study was to evaluate the spectrum and frequency of histopathological diagnoses signed out by oral pathologists at the Department of Pathology, Oslo University Hospital (OUS), Norway during a two-year period. The second aim was to compare the spectrum of histopathological diagnoses with the content of the current syllabus in oral pathology at the Faculty of Dentistry, UiO.

## 2 | MATERIALS AND METHODS

Since 2014, two part-time oral pathologists have been affiliated to the Department of Pathology at OUS in Norway. They sign out about 1600 biopsies annually.

In the present retrospective cross-sectional study, all histological diagnosis signed out by the oral pathologists at OUS during 2015 and 2016 are included. All histopathological reports were analysed with regard to clinical information on the submitting practitioner's profession and specialty, patient's age, gender and place of residence (region), clinical manifestations, as well as clinical and histopathological diagnoses. For analysis purpose, the diagnoses were categorised into eight main disease groups: (1) Jaw cysts, (2) benign tumours and reactive lesions, (3) malignant tumours, (4) white and red lesions, ulcerative and vesiculobullous lesions, (5) pigmented lesions, (6) salivary gland pathologies, (7) odontogenic tumours and (8) jaw lesions other than odontogenic tumours and cysts. The patients were subdivided into eight groups according to age (0–15, 16–25, 26–35, 36–45, 46–55, 56–65, 66–75 and 75+). Due to the risk of identification, gender, age or place of residence were not included in diagnostic groups consisting of  $\leq 5$  patients.

Biopsies showing normal tissue histology and cases where tissue specimen were missing from the container were excluded. Specimens from head and neck sites other than oral cavity were also excluded. The spectrum of histopathological diagnoses was compared to the spectrum of oral diseases taught for dental and dental hygienist students at the Faculty of Dentistry, UiO.

Descriptive statistics and Chi-square tests were performed using the Statistical Package for Social science (SPSS) version 25. The level of significance was set at  $p \leq .05$ . The study was approved by Regional Committees for Medical Research Ethics- South-East Norway (ref: 2017/1904).

## 3 | RESULTS

A total of 3444 histopathological reports were signed out during 2015 and 2016. Forty-two cases were excluded from the study as stated in the material and methods part. In total, 3402 histopathological reports 47% males ( $n = 1591$ ) and 53% females ( $n = 1811$ ) were included for analysis.

### 3.1 | Submitting practitioner

The majority of the biopsies 79% ( $n = 2695$ ) were submitted by oral surgeons. General dental practitioners submitted 12% ( $n = 418$ ) of the biopsies. Altogether, endodontists, periodontists and medical doctors sent  $<10\%$  ( $n = 289$ ) of the biopsies. No submissions were explicitly marked to be sent from specialists in paediatric dentistry.

### 3.2 | The submissions

All submissions contained patient gender and age. Clinical information and/or description of biopsy sites were included in 98.8% ( $n = 3360$ ) of the cases, although the amount of information varied. A tentative diagnosis was suggested in 78.6% ( $n = 2674$ ) of the cases. More than one tentative diagnoses were proposed for 11.8% ( $n = 403$ ) cases. Clinical photos and x-rays were included in 8.8% ( $n = 301$ ) of the submissions.

### 3.3 | Patients' place of residence

The patients were stratified into the five Norwegian health regions. The majority, 86.6% ( $n = 2946$ ) came from the Southern and Eastern Norway, 5.4% ( $n = 185$ ) from the Mid-Norway, 4.6% ( $n = 157$ ) from the Western Norway, 2.7% ( $n = 91$ ) from the South of Norway, and  $<1\%$  ( $n = 23$ ) from the Northern Norway.

### 3.4 | Age of the patients

The highest number of biopsies were found for the 56–65 years age group (Table 1). In 91.5% ( $n = 3112$ ) of the cases, the patients were 26 years or older while 8.5% ( $n = 290$ ) patients were below 26 years. In the latter group, 40.3% ( $n = 117$ ) of the patients were 15 years or younger.

### 3.5 | Histopathological diagnosis

The majority (81.6%,  $n = 2776$ ) of the diagnoses were specific covering 95 different diagnoses in total. Descriptive diagnoses were signed out in 18.4% ( $n = 626$ ) cases, most frequently in group 4 (44.6%,  $n = 279$ ).

### 3.6 | The most frequent diagnoses and their site of occurrence

The periapical granulomas, the most frequent diagnosis, were most frequently located in the periapical region of 16/26, while the radicular cysts were often found with respect to 12 and 46 (Table 2). Dentigerous cysts, hyperplastic dental follicles and odontogenic keratocysts occurred most frequently in the posterior part of the mandible. In the buccal mucosa, bilateral occurrence was reported for lichen planus. In general, a high percentage of correct tentative or differential diagnoses was seen for the most common diagnoses except for the odontogenic keratocyst.

### 3.7 | Frequency of specific diagnoses in each diagnostic group

In the following section, the frequency of specific diagnoses in each of the eight main diagnostic group, are displayed.

TABLE 1 Age groups and distribution of biopsies

Age groups	Number of biopsies (%)
0–15 years	117 (3.4)
16–25 years	173 (5.1)
26–35 years	325 (9.6)
36–45 years	446 (13.1)
46–55 years	629 (18.5)
56–65 years	776 (22.8)
66–75 years	630 (18.5)
>75 years	306 (9.0)
Total	3402 (100)

### 3.7.1 | Group 1. Cysts of the jaws, periapical granulomas and hyperplastic dental follicles

This group constituted 43% of all the histopathological reports. Here, 807 cysts, 548 periapical granulomas and 93 hyperplastic dental follicles were included ( $n = 1448$ ) (Table 3 and Table S1). This group also included 11 less frequently ( $n \leq 5$ ) occurring cysts such as glandular odontogenic cyst, paradental cyst and gingival cyst (Data S8). In 80.2% ( $n = 1162$ ) cases, a tentative diagnosis was suggested and the diagnoses were confirmed histologically in 58.9% ( $n = 685$ ) of the cases. The dentigerous cyst, hyperplastic dental follicles and nasopalatine duct cysts demonstrated a male predominance ( $p = .000$ ,  $p = .034$  and  $p = .038$ , respectively). For the periapical granulomas and most of the cysts, the majority of patients were above 50 years of age. In contrast, hyperplastic dental follicles and solitary bone cysts were diagnosed in younger age groups. The odontogenic keratocyst occurred mainly below 65 years of age and the lateral periodontal cyst was diagnosed only in patients above 35 years. The majority of the cysts were located in the mandible. A low correspondence between the tentative diagnoses and the histopathological diagnoses was found for odontogenic keratocysts and solitary bone cysts.

### 3.7.2 | Group 2. Benign tumours and reactive lesions

Group 2 consisted of 906 benign tumours and reactive lesions constituting 26.6% of all the histopathological reports (Table 3). The fibroepithelial polyps/fibromas were the most common lesions in this group and they demonstrated a female predominance ( $p = .000$ ) (Table S2). In general, Group 2 occurred in middle-aged patients, although the telangiectatic/pyogenic granuloma, peripheral ossifying fibroma and the peripheral giant cell granuloma were found in younger age groups as well and located mainly on the gingiva.

TABLE 2 Frequency and site of occurrence, percentage of tentative/differential diagnoses suggested by the submitting clinician/dentist as well as the percentage of correct differential diagnosis for the 10 most common diagnoses

Diagnoses	Number (%)	Most frequent sites	% of cases with suggestion for differential diagnosis	% of cases with correct differential diagnosis
Periapical granulomas	548 (16)	Periapical regions in 16 and 26	81	96
Fibromas	437 (12)	Buccal mucosa, lips, tongue, corners of the mouth, gingiva	82	77
Radicular cysts	391 (12)	Periapical 12 and 46	82	64
Dentigerous cysts	262 (8)	Impacted 38 and 48	88	88
Mucocele	141 (4)	Lower lip	91	87
Lichen planus	126 (4)	Bilateral buccal mucosa, gingiva	79	70
Hyperplastic dental follicle	93 (3)	Impacted 38 and 48	80	65
Papilloma	83 (3)	Palate and tongue	77	65
Odontogenic keratocysts	60 (2)	Tooth 38	72	32
Osteonecrosis of the jaw	57 (2)	All oral sites	50	47

Main diagnostic groups	Number (%) <sup>a</sup>	Male (%)	Female (%)	Most frequent age group
Cysts, granulomas and dental follicles (Group 1)	1448 (43)	801 (55)	647 (45)	56–65 years
Benign tumours and reactive lesions (Group 2)	906 (27)	365 (40)	541 (60)	46–65 years
White, red, ulcerative and vesiculobullous lesions (Group 4)	562 (17)	237 (42)	325 (58)	56–65 years
Salivary gland pathologies inclusive adenocarcinomas (Group 6)	247 (7)	99 (40)	148 (60)	26–35 years
Jaw lesions (Group 7 and 8)	138 (4)	51 (37)	87 (63)	66–75 years
Malignant tumours (Group 3)	43 <sup>b</sup> (1)	19 (44)	24 (56)	66 and older
Pigmented lesions (Group 5)	36 (1)	12 (33)	24 (67)	56–65 years
Odontogenic tumours (Group 7)	22 (1)	7 (32)	15 (68)	16–25 and 66–75 years
Total		3402		

<sup>a</sup>Percentage of total number of biopsies during 2015 and 2016.

<sup>b</sup>Includes oral squamous cell carcinomas ( $n = 40$ ), carcinoma cuniculatum ( $n = 1$ ), B-cell lymphoma ( $n = 1$ ) and malignant melanoma ( $n = 1$ ). Malignant salivary gland tumours are included in Group 6 ( $n = 6$ ).

A descriptive diagnosis was signed out in 24% ( $n = 216$ ) of the cases.

### 3.7.3 | Group 3. Malignant tumours

This group represented 1.4% ( $n = 49$ ) of the histopathological reports (Table 3 and Table S3). Among the squamous cell carcinomas ( $n = 41$ ) (Table S4 and Data S8), 40 cases were oral squamous cell carcinoma (OSCC), and one was carcinoma cuniculatum. The number of females having OSCC was higher than in men, although this difference was not statistically significant. The number of OSCC cases increased with increasing age and 35% ( $n = 14$ ) of the patients were >75 years. No patients were <30 years of age. Gingiva was the most frequent location (32.5%,  $n = 13$ ), followed by the tongue and the floor of the mouth (both 20%,  $n = 8$ ). In 55% of the cases, the clinician suspected a malignant tumour. Other malignant tumours except for the B-cell lymphoma (Data S8) are discussed in their respective diagnostic group (Groups 5 and 6).

### 3.7.4 | Group 4.

#### White and red lesions, ulcerative and vesiculobullous lesions of the oral mucosa

Lesions in this group consisted of 562 cases, constituting 16.5% of all the histopathological reports (Table 3). A descriptive diagnosis was signed out in 64.6% ( $n = 363$ ) of the cases. The specific diagnoses (33.3%,  $n = 187$ ) are specified in Table S4 and Data S8. For the entire group, 28% ( $n = 166$ ) of the histopathological reports included

TABLE 3 Categorisation of the diagnoses into eight disease groups, total number in each group and distribution with respect to gender and age

a tentative diagnose, which was confirmed by the histopathological diagnose.

Oral lichen planus/lichenoid reactions, the most frequent diagnosis in this group, demonstrated a female predominance ( $p = .003$ ). Although almost 75% of the patients were middle-aged or older, a group of young patients was also identified. Here, eight patients were between 16–35 years. Although bilateral buccal mucosal lesions were the most common, unilateral buccal mucosal lesions were reported in 14% ( $n = 18$ ) cases. In 69.8% ( $n = 88$ ) of the histopathological reports, a tentative diagnose of lichen planus/lichenoid reaction was suggested while leucoplakia was proposed in 6.3% ( $n = 8$ ) cases.

Mucous membrane pemphigoid constituted 1.8% of Group 4. The majority of patients was older than 55 years. A unilateral buccal mucosa lesion was reported in the majority of cases. In 27.3% ( $n = 3$ ) of the cases, mucous membrane pemphigoid was suggested by the clinician. Other differential diagnoses mentioned were lichen planus and pemphigus.

The histological picture of clinical white lesions demonstrated squamous epithelial hyperplasia, hyperkeratosis or a combination of epithelial hyperplasia and keratosis. Squamous epithelial dysplasia was seen in 41 cases. The tongue, buccal mucosa and the floor of the mouth was the most frequent site. Clinical suspicion of an epithelial dysplasia was rarely suggested in the submissions.

### 3.7.5 | Group 5. Pigmented lesions

Pigmented lesions (malignant melanoma ( $n = 1$ ), melanotic macules ( $n = 19$ ) and amalgam tattoos ( $n = 17$ )) constituted <1% ( $n = 37$ ) of

the reports (Table 3, Table S3 and Table S5). Melanotic macule and amalgam tattoo were the most common in 66–75 and 56–65 age groups, respectively. Both lesions were present in the gingiva. About 50% of the tentative diagnoses of the amalgam tattoo were consistent with the histological diagnoses. For the melanotic macules, four tentative diagnoses were in harmony with the histopathological diagnoses, three were suggested a melanoma and five as nevus.

### 3.7.6 | Group 6. Salivary gland lesions

Salivary gland lesions constituted 7.0% ( $n = 247$ ) of all the histopathological reports. Sixty percentage of these lesions occurred in females ( $p = .002$ ) (Table 3). A descriptive diagnosis of salivary gland tissue with fibrosis and chronic inflammation was signed out in 31.5% ( $n = 78$ ) of the cases.

Mucocele was the most common diagnosis (Table S6). Mucocele of the extravasation phenomenon occurred more frequently (88.6%,  $n = 125$ ) than the mucous retention cyst/type (11%,  $n = 16$ ). The lower lip was the primary location (73%,  $n = 91$ ), although some retention cysts also occurred in the upper lip. Twenty percent ( $n = 25$ ) of the extravasation phenomenon occurred in patients below 15 years. For the retention cyst, 93% ( $n = 15$ ) of the patients were older than 36 years. More than 75% of the tentative diagnoses were consistent with the histological diagnoses for mucocele.

Benign tumours constituted 6% ( $n = 15$ ) of the salivary gland pathologies. Pleomorphic adenoma was the most frequent tumour ( $n = 8$ ) and the palate ( $n = 6$ ) was the most common location. Other benign salivary gland tumours ( $n \leq 5$ ) are described in Data S8. The malignant salivary gland tumours, mucoepidermoid carcinoma, adenocarcinoma and adenoid cystic carcinoma, were located in different oral sites (Data S8). Pleomorphic adenoma and malignant salivary gland tumours showed a wide age range. In the majority of cases, the clinicians suggested neither a benign nor a malignant salivary gland tumour.

Sjögren's syndrome (SS) was suggested in 31 histopathological reports, although the histological picture was compatible with SS only in four cases.

### 3.7.7 | Group 7. Odontogenic tumours

Odontogenic tumours constituted 0.6% ( $n = 22$ ) of all the histopathological reports. The peripheral odontogenic fibroma (POF) was most frequent, followed by ameloblastoma (Table 3, Table S7). Ameloblastic fibroma, ameloblastic fibro-odontoma, odontoma, odontogenic myxoma, cementoblastoma and ossifying fibroma were also diagnosed (Data S8). The POF and ameloblastoma occurred most frequently in middle-aged and older patients. The youngest patients with a POF and an ameloblastoma were below 15 and 25 years of age, respectively. The most frequent location for the POF was gingiva, while region 36 and 46 intraosseous were most frequent for ameloblastomas. None of the differential diagnosis suggested POF. Suggestions for ameloblastoma as a differential diagnosis were histopathologically confirmed only in 2/3 of the cases.

### 3.7.8 | Group 8. Other jaw lesions than odontogenic tumours and cysts

This group of lesions ( $n = 138$ ) in the jaws constituted 4% of the biopsies (Table 3). Descriptive diagnoses (granulation tissue and scar-tissue/fibrous connective tissue) were signed out in 42.7% ( $n = 59$ ) of the cases. The majority of patients were of 66–75 years (27%,  $n = 37$ ). Region 36–38/46–48 were most often involved (13% ( $n = 18$ ) and 8.0% ( $n = 11$ ), respectively).

Osteonecrosis was the only specific diagnoses in Group 8 (Table S7) and demonstrated a female predominance ( $p = .017$ ). Here, 49.1% of the patients had received surgery prior to the osteonecrosis. In 3.5% ( $n = 2$ ) radiation therapy as part of head and neck cancer treatment was the cause of the osteonecrosis. Bisphosphonate treatment was reported in 34.8% ( $n = 48$ ) of the osteonecrosis group and included more females ( $n = 36$ ) than males. Cancer treatment (16.7%,  $n = 23$ ) and osteoporosis (11.6%,  $n = 16$ ) were the major indications for the use of bisphosphonate.

## 3.8 | The syllabus in oral pathology needs a minor revision

With the exception of some conditions such as osteonecrosis, melanoma, melanotic macule and the lateral periodontal cyst, other oral diseases/conditions in all the main diagnostic groups were found to be adequately covered in the oral pathology teaching.

## 4 | DISCUSSION

In the present study, we evaluated the spectrum and frequency of histopathological diagnoses signed out by the oral pathologists in Oslo during a two-year period. Based on these findings, areas for improvement or update of the current syllabus in oral pathology at the Faculty of Dentistry in Oslo, Norway were identified.

In addition to their full-time teaching and research positions at the University of Oslo or Bergen, oral pathologists are affiliated part-time to the departments of pathology at OUS and Haukeland University hospital in Bergen. The number of biopsies signed yearly is almost identical in Oslo and Bergen. Thereby, histopathological reports for a period of 2 years in Oslo was selected to assure that the number of biopsies reflected the total number sent to oral pathologists in Norway each year. In total, 3402 histopathological reports were included with a male to female ratio of 0.88. About 100 different diagnoses were signed out. Twenty percent of the diagnoses were descriptive. Teaching of specific diseases might give a wrong impression that every histopathological examination results in a specific diagnosis. Currently, the occurrence of descriptive diagnoses is not well communicated to the students and should be lectured, particularly for the lesions/conditions in Group 4. Here, the highest number of descriptive diagnoses was found. Lack of a characteristic histological picture or lack of adequate clinical information from the submitting clinicians are possible reasons for signing out of descriptive diagnoses. In the

present study, we appreciated the clinical photos and x-rays sent in by about 10% of the clinicians. Although written clinical information was included in almost all reports, the amount of information varied to a great extent. In general, a clinical picture gives more information and is often easier to understand than a written description of an oral lesion. The importance of the clinical details must be emphasised in the future. In addition, the importance of suggesting tentative/differential diagnoses should be stressed. Here, the majority of the submissions included a tentative diagnosis. In cases of a descriptive diagnoses, tentative diagnoses/differential diagnoses give the pathologist an opportunity to discuss the suggested diagnoses in the light of the histopathological findings and thereby guide the clinician in the direction of a certain diagnoses.

In the present study, oral surgeons submitted the majority of biopsies. However, the number of biopsies from general dental practitioners outnumbered the amount of biopsies sent by other dental specialists and medical doctors together. Taking a soft tissue biopsy of presumably benign lesions is an important task of general dentists particularly when there is a difficult access to oral surgeons.<sup>1</sup>

The most common cysts and their frequency in appearance reflected the literature and are included in the oral pathology syllabus in Oslo. However, the lateral periodontal cyst, described as a rare cyst in WHO 2017 occurred at the same frequency as the nasopalatine duct cyst.<sup>6</sup> This observation was surprising and consequently, a more detailed description of this cyst should be included. In general, no male or female gender predilection was found for the entire material. However, there was a statistically significant male predominance for certain odontogenic cysts, while a female predominance was seen for inflammatory and reactive pathologies including salivary gland lesions, fibroepithelial polyps/fibroma, lichen planus/lichenoid reactions and osteonecrosis. A female predominance in inflammatory and reactive pathologies is in line with a recent study.<sup>7</sup> Osteoporosis was four times more common in women than in men and the medication-related osteonecrosis of the jaw related to the Bisphosphonate treatment is a probable explanation for the female predominance in the present study.<sup>8,9</sup>

The number of biopsies increased with the age of the patients heading a peak in the age group 56–65 years. This is in line with data from Portugal.<sup>7</sup> The malignant tumour group contained the highest number of diagnoses after 66 years of age and coincided with the mean age at the time of diagnoses in a recent Norwegian oral cancer multicentre (NOROC) study.<sup>10</sup> The percentage of biopsies from patients 15 years and younger was a little lower than reported in other studies on oral pathologies in paediatric patients.<sup>11–13</sup> However, our material does not include biopsies sent to maxillofacial/head and neck pathologists. Our findings demonstrate the importance of careful examination for other diseases than caries also in young patients and a lecture of age-related oral diseases could be valuable to include.

Although malignant melanoma is a rare tumour in the oral cavity, it is now included in future lecture of malignant tumours to emphasise the importance of a histological evaluation of pigmented lesions, particularly in the palate. Another point is that an amelanotic melanoma might resemble a reactive gingival lesion and warrant the need for histological evaluation of even harmless looking

gingival outgrowths.<sup>14</sup> The tongue, buccal mucosa and the floor of the mouth were the most frequent areas for squamous epithelial dysplasia while gingiva followed by the floor of the mouth and the tongue were the main locations for OSCC. This points out these locations as high risk areas for cancer development. The teaching of squamous epithelial dysplasia and OSCC covers these aspects. In the NOROC study, gingiva and alveolar mucosa were the most frequent areas of OSCC in women.<sup>10</sup> The gingival location of OSCC in the present study probably reflects the female predominance. Benign tumours and reactive lesions were located elsewhere than OSCC. The fibroma/fibroepithelial polyp and papilloma made up the majority of diagnoses and is well covered in the oral pathology teaching.

Salivary gland tumours occurred in young as well as in older patients. Although some submitting clinicians suggested pleomorphic adenoma as a differential diagnosis, the malignant salivary gland tumours were never suggested. This is in contrast to OSCC, where a malignant tumour was suggested in about 50% of the cases. Malignancy is expected in about 50% of oral salivary gland tumours and they should be included among the differential diagnoses, particularly when finding a lump in the upper lip or palate. The lower age of patients with malignant salivary gland tumours compared to squamous cell carcinomas, reveal the importance of their recognition.

Based on this study and our clinical impression of an increasing number of biopsies questioning osteonecrosis, this topic will be emphasised in future lectures for dental and dental hygienist students.

We have compared some of our results with retrospective studies on oral and maxillofacial pathology from different parts of the world. Since the same specific diagnoses often are divided into various diagnostic sub-groups by different authors, a direct comparison is sometimes problematic. In line with the present study, fibrous hyperplasia, chronic periapical granuloma and radicular cyst were the most common diagnoses in an Australian retrospective analysis of oral and maxillofacial pathology.<sup>15</sup> Chronic apical periodontitis and radicular cysts were also among the most prevalent diagnoses in San Diego, USA.<sup>16</sup> In a Chilean institution, the top three diagnoses were irritation fibroma, oral lichen planus and mucocele, respectively.<sup>17</sup> These results are in line with the present study when including the mucosal diagnoses only. Oral lichen planus showed a female predominance in the present study and the result accords well with the studies by Dovigi et al. and Rivera et al.<sup>16,17</sup> The studies from Australia, Chile and USA did not mention lateral periodontal cyst.<sup>15–17</sup> This could be due to a relatively low prevalence of this cyst. In a Turkish study, lateral periodontal cyst constituted 0.12% of odontogenic and non-odontogenic cysts.<sup>18</sup> Here, Tekkesin et al. showed a small variation in the number of this cyst among different countries and our finding is within this range.

## 5 | CONCLUSIONS

Although limited in time and geographical localisation, we believe that our study represents a relevant number of oral pathologies in Norway. Here, we demonstrate a varied spectrum of pathologies

in the oral region. We conclude that a minor revision of the syllabus is needed, although the most frequent oral conditions presented in this study are well covered in the oral pathology teaching in Oslo. However, some important oral conditions such as the lateral periodontal cyst, oral malignant melanoma and melanotic macule as well as osteonecrosis should be emphasised in future teaching. We will consider a more clinic-oriented teaching approach focusing on oral conditions related to age groups and/or oral site and clinical appearance. Finally, the importance of appropriate clinical information for the diagnostic work should be stated and the chance of receiving descriptive diagnoses should be discussed.

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## CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

## AUTHOR CONTRIBUTIONS

All authors conducted the study design. First author collected the data. First and last authors analysed the results and last author wrote the paper. All co-authors critically reviewed, revised and approved the manuscript.

## DATA AVAILABILITY STATEMENT

Data available on request from the authors

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## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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