

Interesting - cases of lower lip  
cancer were higher than upper lip  
cancer in males

## An epidemiologic study of malignant oral tumors in Sweden 1958-77

GÖRAN ANNEROTH<sup>1</sup>, ANN HOLMBERG<sup>1,2</sup> AND EVA LILJA<sup>1,2</sup>

<sup>1</sup>Department of Oral Pathology, <sup>2</sup>Department of Oral Diagnosis, School of Dentistry, Karolinska Institute, Huddinge, Sweden

Anneroth G, Holmberg A, Lilja E. An epidemiologic study of malignant oral tumors in Sweden 1958-77. *Scand J Dent Res* 1983; 91: 296-307.

**Abstract** - The paper presents epidemiologic data of malignant oral tumors in Sweden 1958-77 including the total number of cases, the number and relative frequency of cases in different sublocations of the oral region and the mean annual age standardized incidence rate, all ages, per one million population, by site and sex. An analysis of different histopathologic types of oral tumors is also presented. A comparison is made between the two 10-yr periods 1958-67 and 1968-77. Errors involved in epidemiologic studies are discussed.

**Key words:** epidemiology, oral; histopathology; mucosa, neoplasms.

Göran Anneroth, Department of Oral Pathology, Odontologiska Klinikerna, Box 4064, 141 04 Huddinge, Sweden. Ann Holmberg, Department of Oral Diagnosis, Odontologiska klinikerna, Box 4064, 141 04 Huddinge, Sweden.

Accepted for publication 4 December 1982.

Epidemiologic studies yield important information about the relative incidence and trends of many diseases in different anatomic locations. Results from such studies, mostly available in the form of statistical material in publications of the World Health Organization and in cancer registries of different countries, can be used to analyze further different etiologic factors important in the prevention, treatment and outcome of many diseases. Epidemiologic studies have shown that oral cancer is more common in certain areas of the world than in others (1), that there is a difference in relative frequency of oral cancer between the different primary sites within the oral region (2) and that there are certain etiologic factors which significantly increase the risk of developing oral cancer (3).

Since 1958 the Swedish Cancer Registry has

received compulsory reports from all physicians on newly detected cases of cancer and related diseases in the whole country. In the present study figures from this registry were used for an epidemiologic study of oral malignant tumors in Sweden.

The aim of the study was: 1) to serve as a more detailed and comprehensive information about the incidence of oral malignant tumors than the annual reports published by the Swedish Cancer Registry, 2) to analyze the occurrence of different histologic types of oral tumors, and 3) to compare epidemiologic data between the two time periods 1958-67 and 1968-77.

### Material and methods

The material comprised statistical data from the

Table 1  
Standard population in Sweden (the census of 1970)

Age	%	Age	%
0-4	6.9	45-49	6.5
5-9	7.1	50-54	6.5
10-14	6.6	55-59	6.3
15-19	6.8	60-64	5.9
20-24	8.1	65-69	5.0
25-29	7.8	70-74	3.9
30-34	6.1	75-79	2.7
35-39	5.5	80-84	1.5
40-44	5.8	85-	0.9
Total			100

Swedish Cancer Registry on new malignant tumors in the mouth-pharynx region diagnosed in Sweden 1958-77.

For the coding of the primary site and the histopathologic types of tumors the code systems by WHO were followed (4, 5). The study included the following sublocations of the oral region: lips, tongue, floor of mouth, oral cavity other sites including the palatal, buccal and alveolar mucosa as well as the gingiva, mesopharynx and salivary glands.

The following data were calculated for oral malignant tumors in Sweden 1958-77: 1) the total number of new cases, 2) the number of cases in different sublocations of the oral region, 3) the relative frequency of malignant oral tumors in a given sublocation expressed as percentage of the total number of oral malignant tumors, 4) the mean annual age standardized incidence rate, all ages, per 1 million population by site and sex, and 5) the number of tumors of different histopathologic type within each oral sublocation.

The mean population of Sweden for the time periods 1958-67 and 1968-77 (Table 1), respectively, was used for calculations of the mean annual age standardized incidence rate, all ages, per 1 million population (6).

In order to make a comparison possible between the two 10-yr periods, and to avoid the influence of differences in age distribution, direct standardization was used to provide a standardized incidence rate using a standard population - the census of 1970 (1, 7).

The percentual distribution of the basis of diagnosis for each localization was calculated according to the coding system used by the Cancer Registry (7). As an average histologic and/or cytologic verifications of the diagnosis were available in 98.6% of the cases. When calculating the percentual distribution of different histologic types of cancer the unspecified types of tumors were excluded.

If more than one primary oral tumor was detected in the same person each tumor was registered as one case.

Table 2

Malignant tumors in the mouth-pharynx region in Sweden 1958-77. Total number of tumors and percentual distribution within different sublocations in relation to all malignant tumors in the region

Oral sublocations	Total number of cases			Percentual distribution		
	1958-77			1958-77		
	M	F	M + F	M	F	M + F
Lip	3255	333	3588	49.6	11.6	38.0
Tongue	788	647	1435	12.0	22.6	15.2
Floor of mouth	226	82	308	3.4	2.9	3.3
Oral cavity other sites	1101	820	1921	16.8	28.6	20.4
Mesopharynx	425	197	622	6.5	6.9	6.6
Salivary glands	772	787	1559	11.7	27.4	16.5
Total	6567	2866	9433	100.0	100.0	100.0

Table 3

*Malignant tumors in mouth-pharynx region in Sweden 1958-77. Total number of cases and mean annual age standardized incidence rate per 1 million population, by sex and site*

	Total number of cases						Mean annual age standardized incidence rate per 1 million population					
	1958-67			1968-77			1958-67			1968-77		
	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F
Oral sublocations												
Upper lip	72	43	115	81	81	142	2.3	1.2	21.7	2.2	1.4	1.7
Lower lip	1340	91	1431	1568	112	1680	40.3	2.5	20.3	41.6	2.4	20.4
Lip unspecified	81	14	95	113	12	125	2.4	0.4	1.3	3.0	0.3	23.7
Lip	1493	148	1641	1762	185	1947	45.0	4.0	23.3	46.8	4.1	23.7
Tongue	337	298	635	451	349	800	10.2	8.1	9.1	11.8	7.9	9.8
Floor of mouth	65	34	99	161	48	209	1.9	0.9	1.4	4.2	1.1	2.5
Oral cavity - other sites	509	371	880	592	449	1041	15.7	9.6	12.4	15.9	10.0	12.6
Total number intraoral region	911	703	1614	1204	846	2050	27.8	18.6	22.9	31.8	18.9	25.0
Mesopharynx	191	75	266	234	122	356	5.7	2.0	3.8	6.0	2.8	4.3

### Results

The total number of cases, for the period examined, of malignant tumors in the mouth-pharynx region and the percentual distribution within the different sublocations in relation to all malignant tumors in the region is compiled in Table 2. The highest relative frequency was noticed for lips (38.0%) and the lowest frequency for the floor of mouth (3.3%). The highest percentage for males was found in lips (49.6%), while the corresponding figures for females were observed in the locations salivary glands (27.4%) and tongue (22.6%).

The total number of cases for the period 1958-77, 9433, represented 1.8% of all cancers (2.5% of all male and 1.1% of all female cancers) in Sweden.

If malignant tumors in mesopharynx and salivary glands were excluded the total number of cases for the period 1958-77 amounted to 7252 cases, representing 1.4% of all cancers (2.1% of all male and 0.9% of all female cancers).

*Tumors of the lip* - The total number of cases and the mean annual age standardized incidence rate, per 1 million population, by sex and site, of malignant lip tumors are presented in Table 3.

Lip cancer was 12 times as frequent in the lower as in the upper lip (1958-1977). The majority of lip cancers (81%) were found in the lower lip of males. The male:female ratio was for the lower lip 14.3:1 (1958-77) and for the upper lip 1.5:1 (1958-77).

The mean annual standardized incidence rate of malignant lower lip tumors was for males 41.1 and for females 2.5 cases per 1 million population

Table 4

*Malignant tumors of the lip in Sweden 1958-77. Total number of histopathologic types*

Histopathologic type	Lip					
	1958-67			1968-77		
	M	F	M + F	M	F	M + F
Squamous cell carcinoma	1431	125	1556	1717	164	1881
Mixed basal cell and squamous cell carcinoma	4	6	10	5	5	10
Adenoid cystic carcinoma	-	1	1	5	7	12
Mucoepidermoid carcinoma	-	-	-	6	-	6
Malignant salivary gland tumor of mixed type	7	4	11	1	1	2
Acinic cell carcinoma	-	-	-	1	1	2
Adenocarcinoma	-	-	-	2	1	3
Malignant melanoma	1	1	2	2	1	3
Other specified malignant tumors	1	1	2	2	-	2
Unspecified malignant epithelial tumor	19	4	23	2	3	5
Unspecified malignant mesenchymal tumor	1	1	-	1	-	1
Unspecified malignant tumor	30	6	36	18	2	20
Total no.	1493	148	1641	1762	185	1947

(1958-77). The corresponding figures for the upper lip were 2.2 (males) and 1.3 (females) respectively. The mean annual age standardized incidence rate increased from 23.3 to 23.7 cases per 1 million population between the time periods 1958-67 and 1968-77. The increase was for males from 45.0 to 46.8 cases and for females from 4.0 to 4.1 cases.

The different histologic types of lip cancer are tabulated in Table 4. The overall dominant type was squamous cell carcinoma, which occurred in 98.1% of the cases (1958-77). Different types of malignant accessory salivary gland tumors were present in 1.1% of the cases. The group "other specified malignant tumors" comprised three fibrosarcomas and one rhabdomyosarcoma.

*Tumors of the tongue and the floor of mouth* - The number of cases with cancer in the tongue and the floor of mouth is presented in Table 3, where also the mean annual age standardized incidence rate per 1 million population by sex and site is tabulated.

Of the total number of cancers in the tongue and the floor of mouth the tongue lesions represented 82.3% (1958-1977). The incidence of cancer in the base of the tongue was considerably lower than in the other part of the tongue. The male:female ratio for cancer in the tongue and floor of mouth was 1.4:1 (1958-77).

The mean annual age standardized incidence rate of malignant tongue and floor of mouth tumors was for males 14.1 and for females 9.0 cases per 1 million population (1958-1977). Expressed in mean annual age standardized incidence rate, the incidence of the malignant tongue and floor of mouth lesions, increased, from 10.5 to 12.3 cases per 1 million population between the time periods 1958-67 and 1968-77.

The histopathologic types of malignant tumors of the tongue and the floor of mouth are presented in Table 5. Most of the cancers were squamous cell carcinoma, 95.9% whereas malignant salivary gland tumors represented 3.8% of the cases (1958-1977). The group "other specified malignant tumors" comprised one fibrosarcoma, two rhabdomyosarcomas and one papillary transitional cell carcinoma.

#### *Tumors in oral cavity; other sites and mesopharynx*

The overall number and the mean annual age standardized incidence rate per 1 million population of malignant tumors by sex and site in the oral cavity, other sites, and in mesopharynx are tabulated in Table 3. Cancer in other sites of the oral cavity, which included buccal, alveolar and palatal mucosa as well as gingiva, was more common than cancer in the tongue and the floor of mouth. The male:female ratio was for oral cavity - other sites 1.3:1 and for mesopharynx 2.2:1 (1958-77).

The mean annual age standardized incidence rate for malignant lesions in oral cavity - other sites was for males 15.8 and for females 9.8 cases per 1 million population (1958-1977). An increase in the mean annual age standardized incidence rate from 12.4 to 12.6 cases per 1 million population was observed for this location between the time periods 1958-67 and 1968-77.

The histopathologic types of tumors in oral cavity, other sites, and in mesopharynx are shown in Table 5. The most common type was squamous cell carcinoma with 84.1% (1958-77) of all cancers in the oral cavity, other sites, and with 95.1% (1958-77) of all cancers in mesopharynx. The second most common histopathologic type of tumor in the oral cavity, other sites, was various malignant salivary gland tumors. The group "other specified malignant tumors" comprised for oral cavity, other sites, nine fibrosarcomas, one rhabdomyosarcoma, two malignant hemangioendothelioma, two malignant granular cell myoblastoma, one myxofibrosarcoma, one malignant cylindroma of the skin, one leiomyosarcoma, one malignant mesenchymal mixed tumor and one desmoid. The corresponding figures for mesopharynx were one fibrosarcoma, one rhabdomyosarcoma, two papillary transitional cell carcinoma, one malignant hemangioendothelioma and one malignant hemangiopericytoma.

*Intraoral tumors* - Malignant tumors in the tongue, floor of mouth and oral cavity, other sites, constitute the intraoral cancer group.

In Table 3 the total number and the mean annual age standardized incidence rate per 1

Table 5

*Malignant tumors in intraoral region and in mesopharynx in Sweden 1958-77. Total number of histopathologic types*

Histopathological type	Tongue				Floor of mouth				Oral cavity - other sites				Mesopharynx			
	1958-67		1968-77		1958-67		1968-77		1958-67		1968-77		1958-67		1968-77	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Squamous cell carcinoma	303	269	419	317	57	26	151	39	416	273	491	338	134	48	196	85
Adenoid cystic carcinoma			11	5			4	3	2	4	23	39				
Mucoepidermoid carcinoma	-	-	1	7	-	-	1	3	-	3	23	31	-		2	2
Malignant salivary gland tumor of mixed type	6	5	2	1		2	-	-	39	43	1	4	4	2	1	-
Acinic cell carcinoma	-	-		-	-		-	-		2	2	2		-	-	-
Adenocarcinoma	-	1	2	7	-	-		1	6	9	7	8	1	-	2	2
Malignant melanoma	1	-	-		-	-		-	3	4	11	3				1
Other specified malignant tumors	2	1	1	-		-	-		4	4	8	3	4	1	-	1
Unspecified malignant epithelial tumor	19	11	11	4	4	3	5	1	26	24	18	12	33	16	20	18
Unspecified malignant mesenchymal tumor	1	-		2	-	-		-	2	1	1		-	-	-	1
Unspecified malignant tumor	5	11	4	6	4	3	-	1	11	4	7	9	15	8	13	12
Total no.	337	298	451	349	65	34	161	48	509	371	592	449	191	75	234	122

million population and in Table 5 the number of histopathologic tumor types by sex and site of the intraoral region are tabulated.

The tongue cancer lesions comprised 39.2% of the cases, while cancer in the floor of mouth and in the oral cavity, other sites, occurred in 8.4% and 52.4% of the cases respectively (1958-77).

The mean annual age standardized incidence rate for the intraoral region was for males 29.9 and for females 18.8 cases per 1 million population (1958-77). There was an increase in the mean annual age standardized incidence rate from 22.9 to 25.0 cases per 1 million population between the time periods 1958-67 and 1968-77. The increase was for males from 27.8 to 31.8 cases and for females from 18.6 to 18.9 cases.

The squamous cell carcinoma constituted 89.7% (1958-77) of the total number of intraoral cancers. The next most common histopathologic type of intraoral tumor was malignant salivary gland tumors (9.0%). The group unspecified malignant oral tumors amounted to 5.7%.

*Malignant salivary gland tumors in major salivary glands* - The overall incidence of salivary gland tumors are presented in Table 6. These tumors occurred in the parotid gland 3.6 times as often as in the other salivary glands. Malignant salivary gland tumors in the sublingual glands were rare.

The mean annual age standardized incidence rate was 10.7 and 9.8 cases per 1 million population respectively for males and females (1958-77). There was an increase in the mean annual age standardized incidence rate between the time periods 1958-67 and 1968-77 from 9.4 to 10.8 cases (14.8%) per 1 million population. The increase was for males from 9.6 to 11.6 cases and for females from 9.3 to 10.2 cases.

The number of different histopathologic types of salivary gland tumors is tabulated in Table 7. Concerning the distribution of histopathologic types there was a difference between the two time periods examined. The most common type of tumor for the time period 1958-77 was in the parotid gland malignant salivary gland tumor of

Table 6

*Malignant tumors of the salivary glands in Sweden 1958-77. Total number of cases and mean annual age standardized incidence rate, per 1 million population, by sex and site*

Oral sublocations	Total no. of cases						Mean annual age standardized incidence rate per 1 million population					
	1958-67			1968-77			1958-67			1968-77		
	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F
Parotid gland	270	290	560	334	329	663	8.0	7.7	7.8	8.7	7.6	8.1
Sublingual gland	1	6	7	9	13	22	-	0.2	0.1	0.2	0.3	0.3
Submandibular gland	44	39	83	71	60	131	1.2	1.0	1.1	1.9	1.4	1.6
Multiple or unspecified glands	13	17	30	30	33	63	0.4	0.4	0.4	0.8	0.9	0.8
Total no.	328	352	680	444	435	879	9.6	9.3	9.4	11.6	10.2	10.8

Table 7

*Malignant tumors of parotid, sublingual and submandibular salivary glands and of multiple or unspecified salivary glands in Sweden 1958-77. Total number of histopathologic types*

Histopathologic type	Parotid gland				Sublingual gland				Submandibular gland				Multiple or unspecified gland			
	1958-67		1968-77		1958-67		1968-77		1958-67		1968-77		1958-67		1968-77	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Squamous cell carcinoma	14	5	24	9	1	-	4	3	3	1	16	3	-	-	2	1
Adenoid cystic carcinoma	25	29	35	68	-	2	3	3	11	10	20	30	-	1	8	13
Mucoepidermoid carcinoma	15	22	90	77	-	-	1	3	3	2	9	10	-	-	9	7
Malignant salivary gland tumor of mixed type	90	100	39	38	-	1	-	1	11	15	6	6	10	10	2	2
Acinic cell carcinoma	19	39	33	61	-	-	-	-	2	2	2	1	-	1	2	2
Adenocarcinoma	44	50	60	33	-	2	-	1	3	4	11	6	-	2	4	4
Malignant melanoma	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Other specified malignant tumors	-	2	1	3	-	-	-	-	-	-	-	-	-	-	-	-
Unspecified malignant epithelial tumor	46	35	40	31	-	-	1	-	9	3	7	3	1	2	3	3
Unspecified malignant mesenchymal tumor	1	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-
Unspecified malignant tumor	13	8	11	8	-	1	-	2	2	2	-	1	1	1	-	1
Total no.	270	290	334	329	1	6	9	13	44	39	71	60	13	17	30	33



mixed type (267 of 1026 cases), in the sublingual gland squamous cell carcinoma and adenoid cystic carcinoma (8 of 25 cases respectively) and in the submandibular gland adenoid cystic carcinoma (71 of 187 cases).

The malignant major salivary gland tumors for the period 1958-77 amounted to 1318 cases, of which 18.8% were mucoepidermoid carcinoma, 19.6% adenoid cystic carcinoma, 25.1% malignant salivary gland tumor of mixed type, 17.0% adenocarcinoma, 12.4% acinic cell carcinoma and 6.5 squamous cell carcinoma. The group "other specified malignant tumors", which all were localized in the parotid gland, comprised two fibrosarcoma, one mixed basal cell and squamous cell carcinoma, one carcinosarcoma, one liposarcoma and one malignant teratoma.

### Discussion

In this investigation the occurrence of malignant oral tumors during two 10-yr periods was analyzed and compared. The source for the data used, the Swedish Cancer Registry, is unique in respect of its high reliability (8). The reporting to the Registry is estimated to be close to 100% and approximately 94% of the reported cases are morphologically verified. In this study the percentage of morphologically verified cases was close to 100%.

New information concerning some previously registered cases is continuously delivered to the Swedish Cancer Registry. In addition new cases are reported. As these additional informations are included in the present study the figures presented in this report slightly deviate from those in the annual reports published by the Registry.

The material of the Swedish Cancer Registry is based upon compulsory reports from the physicians. In spite of this compulsory system there are some cases never reported to the Registry.

As the Registry has become more and more well-known among the public and physicians during the investigation period the willingness to report might have changed.

Many clinically undetected cancers will remain undiagnosed as autopsy is not always performed especially in older age groups, where the frequency of cancer is high. Oral cancer is located in a region, however, which is easy to inspect and can therefore be expected to be diagnosed relatively more frequently than cancers located in for example such areas as the abdominal cavity.

Differences in diagnostic criteria among pathologists may also contribute to the material's lack of reliability. The morphologic criteria for malign and benign conditions vary with the pathologist's training and experience and might therefore have influenced the result of the histopathologic diagnoses especially in the borderline cases between malign and benign lesions (8). These factors might partly explain the great discrepancy between the different histologic types of salivary gland tumors between the time periods 1958-67 and 1968-77.

When discussing an increase or decrease in oral cancer frequency or incidence between the two examined 10-yr periods one must consider other factors that might have influenced the data upon which an increase or decrease was determined. The overall increase in the age of population and the number of people living in the country are examples of which consideration must be taken as well as to the introduction of better health programs for the population providing better resources for more adequate diagnosis and treatment.

The number of malignant tumors in the mouth-pharynx region in relation to all cancers in Sweden was in this study low in comparison with corresponding figures in most other countries both in the western part of the world and in South East Asia (1, 9).

As in all other countries the males in Sweden had a higher rate of oral cancers than the females, even if the male:female ratio was among the lowest in the world (1). The oral cancer mortality rate has according to a number of reports (10-12) increased during the last decades. The result of this study of the oral cancer morbidity rate also indicated an increase in the

annual  
million  
1958-77

Lip  
includ  
lion be  
the m  
acco  
count  
the in  
howev  
incide  
count

The  
Swede  
magni  
(13, 14)

The  
presun  
these  
backgr  
as the  
(1, 2, 3)

Intra  
cancer  
The hi  
(Bom  
the m  
rates  
male  
female

The  
varies  
and M  
decrea  
the las  
cations  
consum  
major  
frequ

The  
compar  
low an  
ries (1  
Vinson  
and in  
women

annually mean number of new cases per 1 million population between the time periods 1958-67 and 1968-77.

*Lip cancer* - Lip cancer, which in this study included malignant tumors both in the vermillion border and the labial mucosa, accounted for the majority of reported cases. This was in accordance with investigations in most other countries (1). At an international comparison the incidence rate of lip cancer in Sweden, however, is low and Sweden has less lip cancer incidence than any of the other Scandinavian countries (8, 13, 14).

The male predominance of lip cancer in Sweden was in this study of about the same magnitude as in most other western countries (13, 14).

There are a number of etiologic factors which presumably play a role in the development of these lesions such as ultraviolet radiation, ethnic background, tobacco and alcohol habits as well as the social and health status of the individual (1, 2, 9, 15-19).

*Intraoral cancer* - The incidence of intraoral cancer varies between different countries (1). The highest rates have been reported in India (Bombay), but in most countries as in Sweden, the mean annual age standardized incidence rates range between 20-30 cases per 1 million male population and 10-20 cases per 1 million female population.

The male:female ratio for intraoral cancer varies between 4 (Connecticut) and 1 (Iceland and Mozambique) and has been reported to decrease considerably in many countries during the last decades for different intraoral sublocations (20, 21). An increase in cigarette consumption in women is probably one of the major factors responsible for the increased frequency of intraoral cancer in women (22).

The male:female ratio in Sweden, when compared with other countries, was relatively low and lowest among the Scandinavian countries (14). A relationship between Plummer-Vinson syndrome and cancer in the oral cavity and in the upper alimentary tract of Swedish women has been reported (23-25). One reason

for the relatively high incidence of intraoral cancer in women in Sweden might therefore be the high prevalence of Plummer-Vinson syndrome (sideropenic dysphagia) in this country (26, 27).

When discussing relative frequencies of malignant tumors in different intraoral sublocations it is essential to emphasize some factors of importance for the understanding of the significance of the presented figures. Firstly, many times it is only possible to separate early cases of cancer in the tongue and floor of mouth as clinical anatomic entities. In most cases of advanced tumor stages, adjacent tissue structures are involved including extension to the gingiva, alveolar mucosa, soft palate and pharyngeal wall (22, 28, 29). Secondly, one has to consider that the anatomic subclassifications used in different countries vary to some extent. It is therefore often difficult to know whether variations in reported frequencies are due to real differences or to differences in applied site classification. The relative frequency of malignant intraoral tumors differs widely between different published series (7, 14, 30-33) and accordingly the relative frequency of malignant tumors in the tongue has been reported to vary between 39 and 59% and in the floor of mouth between 2 and 24% (14).

It should be emphasized that malignant lymphoma (lymphomasarcomas and reticulum cell sarcomas) were excluded in this study as the locations of these tumors were not available in the Swedish Cancer Registry. Among the non-squamous malignant tumors of the tongue, the lymphoma group is the most frequent and it is known from other studies that 15% of these lesions are located in the mouth-pharynx and the respiratory organ regions (3). If these lesions had been included in this study the overall number of lesions had increased and the distribution of the histopathologic types had changed with less predominance for the squamous cell carcinoma type.

*Malignant salivary gland tumors* - Malignant tumors in salivary glands are relatively uncommon (34). The observed predominance for malignant salivary gland tumors in the parotid

gland in the present study have been reported in earlier investigations (34).

The tumors of the salivary glands constitute a heterogeneous group of tumors, the morphology of which exhibits great variations. A number of classifications of salivary gland tumors have been suggested. The different sites of origin and the incomplete knowledge of the histogenesis of the salivary gland tumors are contributing factors to the lack of a universally accepted classification system. It is only during the last decade that a relatively uniform terminology has been used for these lesions.

Many of the earlier diagnosed so-called malignant salivary gland tumors of the mixed type are now diagnosed as adenoid cystic carcinoma (34), which might explain why in the present study the number of diagnosed malignant salivary gland tumor of mixed type decreased, while the number of diagnosed adenoid cystic carcinoma increased between the time periods 1958-67 and 1968-77.

Adenoid cystic carcinoma has been reported to be uncommon in the major salivary glands (35). In the present study, however, 16.5% of the cases of malignant salivary gland tumors were adenoid cystic carcinoma. Of the minor or accessory salivary gland tumors adenoid cystic carcinoma was the most frequent malignant tumor, which was in agreement with previously reported findings (36).

**Acknowledgments** - For valuable help with the material the authors are indebted to Professor JAN ERICSSON, Uppsala, Assistant Director BIRGITTA MALKER, The Swedish Cancer Registry, Stockholm, Associate Professor ROLF BERGIN and fil. kand. TORE OLAFSSON, Department of Medical Information Processing, Karolinska Institute, Stockholm, Sweden. The study was supported by grants from the Swedish Dental Society and from the School of Dentistry, Karolinska Institute, Stockholm, Sweden.

## References

1. WATERHOUSE J, MUIR C, CORREA P. *Cancer incidence in five continents*. Lyon: International Agency for Research on Cancer, 1976; 3.
2. SÖDER P-O. The incidence of malignant tumours in the mouth-pharynx region in Sweden 1958-1967. *Swed Dent J* 1973; **66**: 419-28.
3. CUTLER SJ, YOUNG JL. *Third National Cancer Survey: incidence data*. Bethesda, MD: National Cancer Institute Monograph no. 41. U.S.A. Department of Health, Education and Welfare, Public Health Service, March 1975.
4. WORLD HEALTH ORGANIZATION. Code for Anatomical Location. HS/CANC/24.1.7th revision. Geneva, 1957.
5. WORLD HEALTH ORGANIZATION. Histology Code. HS/CANC/24.1.8th revision. Geneva, 1956.
6. SVENSKA OFFICIELLA STATISTIKEN (SOF). Befolkningstörändringar Del 3 (1958-1977). National Central Bureau of Statistics in Sweden, Stockholm 1977.
7. *Cancer Incidence in Sweden 1958, 1959 ... 1977*. The National Board of Health and Welfare, Stockholm: The Cancer Registry, 1960-81.
8. RINGERTZ N, ERICSSON J, MATTSSON B, BOLANDER A-M. *Cancer incidence in Sweden 1959-1965*. National Board of Health and Welfare, Stockholm: The Cancer Registry, 1971.
9. PINDBOG JJ. *Oral cancer and precancer*. Bristol: John Wright & Sons, 1980.
10. PHILLIPS AJ. Cancer mortality trends in Canada 1941 to 1958. *Br J Cancer* 1961; **15**: 1-9.
11. RUSSELL MH. Diverging sex-morbidity trends in cancer of mouth: hospital morbidity study. *Br Med J* 1955; **2**: 823-7.
12. WOOD CAP. The treatment of malignant disease of the face and jaws by radiation. *Br Dent J* 1961; **110**: 234-5.
13. RINGERTZ N, ed. *Cancer incidence in Finland, Iceland, Norway and Sweden. A comparative study*. Acta Path Scand Section A. 1971; Suppl 224.
14. SAINIO P. Intraoral squamous cell carcinoma. Finland, 1953-1962. Incidence, clinical manifestations and histopathological grade of malignancy. *Proc Finn Dent Soc* 1977; Suppl 3, 73.
15. DORN CR, SCHNEIDER R, TAYLOR DON. Sunlight exposure and risk of developing cutaneous and oral squamous carcinomas in white rats. *J Natl Cancer Inst* 1971; **46**: 1073-8.
16. EPSTEIN JH, FUKUYAMA K, URBACH F. *Ultraviolet light carcinogenesis. The biologic effects of ultraviolet radiation - with emphasis on the skin*. New York: Pergamon Press, 1969.
17. LINDQUIST C, TEPPA L. Epidemiological evaluation of sunlight as a risk factor of lipcancer. *Br J Cancer* 1978; **37**: 983-9.

Chausage

140327

18. SPITZER WO, HILL GB, CHAMBERS LW. The occupation of fishing as a risk factor in cancer of the lip. *New Engl J Med* 1974; **293**: 419-24.
19. SZPAK CA, STONE MJ, FRENKEL EP. Some observations concerning the demographic and geographic incidence of carcinoma of the lip and buccal cavity. *Cancer* 1977; **40**: 343-8.
20. AXTELL LM, CUTLER SJ, MAYERS MH. *Results in cancer*. Report No. 4: Bethesda, Md: USA, DHEW Publication No (NIH); 73: 272; 1972.
21. EASSON EC, PALMER MK. Prognostic factors in oral cancer. *Clin Oncol* 1976; **2**: 191-202.
22. HARROLD CC. Management of cancer of the floor of the mouth. *Am J Surg* 1971; **22**: 487-93.
23. AHLBOM HE. Simple achlorhydric anaemia, Plummer-Vinson Syndrome and carcinoma of the mouth, pharynx and oesophagus in women. *Br Med J* 1936; **2**: 331-3.
24. LARSSON L-G, SANDSTRÖM A, WESTLING P. Relationship of Plummer-Vinson disease to cancer of the upper alimentary tract in Sweden. *Cancer Res* 1975; **35**: 3308-16.
25. WYNDER EL, HULTBERG S, JACOBSSON F, BROSS IJ. Environmental factors in cancer of the upper alimentary tract. A Swedish study with special reference to Plummer-Vinson (Paterson-Kelly) syndrome. *Cancer* 1957; **10**: 470-87.
26. WALDENSTRÖM J, HALLEN L. Iron and epithelium. Some clinical observations. *Acta Med Scand* 1938; Suppl 90, 380-405.
27. WALDENSTRÖM J. Incidence of "iron deficiency" (sideropenia) in some rural and urban populations. *Acta Med Scand* 1946; Suppl 170, 252-79.
28. CADE S. Carcinoma of the floor of the mouth. *Br J Surg* 1953; **41**: 225-30.
29. FRAZELL EL, LUCAS JC. Cancer of the tongue. Report of the management of 1554 patients. *Cancer* 1962; **15**: 1085-99.
30. ASH CL. Oral cancer: A 20 year study. *Am J Roentgenol Radium Ther Nucl Med* 1962; **87**: 417-30.
31. KHANOLKAR UR. Oral cancer in India. *Acta Unio Int Cancer* 1959; **15**: 67-77.
32. NIEMANN H, YU D, GREGL A, BLECH H-J. Klinische Symptomatik, Therapie und Krankheitsverlauf des Wangenschleimhautkarzinom. *Strahlentherapie (Sonderb)* 1969; **68**: 169-77.
33. THIECKE RW, BERNIER JL. Statistical and morphological analysis of four hundred and one cases of intraoral squamous cell carcinoma. *J Am Dent Assoc* 1954; **49**: 684-98.
34. BATSAKIS JG. *Tumours of the head and neck*. 1st ed. Baltimore: Williams & Wilkins, 1974; 86.
35. LEEGAARD T, LINDEMAN H. Salivary gland tumours: clinical picture and treatment. *Acta Otolaryngol* 1970; **263**: 155-9.
36. RUSSEL H. Adenomatous tumours of the anterior foregut region showing the cylindroma pattern. *Br J Surg* 1955; **43**: 248-54.