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Malignant Oral Tumours in Sweden 1960–1989—an Epidemiological Study

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Epidemiological data from the Swedish Cancer Registry of new cases of malignant oral tumours in Sweden 1960–1989 are presented, including the total number and the age-standardised incidence rate per 1 million population, by site and sex, ($I^{(s)}$). An analysis of the various histopathological types of malignant oral tumours in the different sublocations is also given. A comparison is made between the three 10-year periods 1960–1969, 1970–1979 and 1980–1989 regarding total number and $I^{(s)}$. The total number of cases, 17 158, represented 1.8% of all newly diagnosed cancers in Sweden. The following relative frequencies were noted for the respective sites: intra-oral region 0.7%, lip 0.6% and pharynx 0.5%. The results indicated an increase in total number and a statistically significant increase of $I^{(s)}$ for malignant lip tumours in females over the whole period. A corresponding increase in total number during the periods 1960–1969 and 1980–1989 and a decrease in $I^{(s)}$ during the periods 1970–1979 and 1980–1989 in lip tumours for males was observed. For males there was an increase in total number and a statistically significant increase in $I^{(s)}$ for malignant tongue tumours, while the corresponding figures for females remained constant. For malignant floor of the mouth tumours there was an increase in total number and a statistically significant increase in $I^{(s)}$ for both men and women. In the intra-oral region, including the sublocations oral cavity-other sites, tongue and floor of the mouth, the male: female ratio was 1.8:1 and $I^{(s)}$ changed from 22.8 (1960–1969) to 29.6 (1980–1989). In the pharynx the male: female ratio was 2.4:1 with an $I^{(s)}$ of 29 and 12 cases for males and females, respectively. The most pronounced change in the male: female ratio was observed for the hypopharynx, where the ratio changed from 1.5:1 (1960–1969) to 4.9:1 (1980–1989). A marked increase in $I^{(s)}$ was found in the mesopharynx, from 3.7 to 7.8 when the periods 1960–1969 and 1980–1989 were compared. In the other sublocations of the pharynx, no corresponding statistically significant differences were found.

Keywords: epidemiology, oral, malignancy, tumour, histopathology

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INTRODUCTION

GLOBAL EPIDEMIOLOGICAL studies have shown that the prevalence of oral cancer varies among different parts of the world and also among different sublocations of the oral cavity [1]. Thus, the relative frequency of oral cancer ranges from less than 0.1% to over 40% [2]. The average incidence rates per 1 million of the population for the various sublocations within the oro-facial regions have been published in volume V of *Cancer Incidence in Five Continents* [1]. In high-prevalence parts of the world, oral cancer is often the first or second most common malignancy site [3]. The prevalence of cancer, including oral cancer, increases with increasing age, even if the pattern of age distribution varies among different countries. In the western world, 98% of oral cancer patients are over 40 years of age [4, 5].

Cohort studies have shown that the incidence of oral cancer will increase in the future in many of the industrialised countries in Europe [6–11]. One of the most important reasons is that the pathogenesis of oral cancer is still unknown, even though it is obvious, from many studies [6–11], that in industrialised countries the use of tobacco especially in combination with alcohol consumption, is an important aetiological factor [1]. Various nutritional deficiencies have also been considered as essential causative factors [14]. To summarise, one can conclude that the cause of oral cancer is basically unknown, even if some aetiological predisposing factors and carcinogens have been found. It is, therefore, important to follow the development of oral cancer in different countries.

In most of the industrialised countries in the western part of the world official cancer registries have been established and WHO has a special organisation for collecting and coordinating epidemiological cancer data. Trends concerning incidence,

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relative frequency and prevalence are effectively noted by these official registries. The results of analysing such figures can provide valuable information about the development of oral cancer diseases and can be used to further analyse different important aetiological factors in the prevention, treatment and outcome of cancer diseases.

The Swedish Cancer Register was started in 1958 and publishes annually *Cancer Incidence in Sweden*. The Swedish Cancer Register is administered by the National Board of Health and Welfare and is based on compulsory reports from all physicians (clinicians) in Sweden. In addition, pathologists, cytologists and forensic autopsy specialists submit independent compulsory reports of every cancer diagnosis made on surgical biopsies, cytological specimens and autopsies. Thus, the registry checks the completeness of reporting from two independent sources, clinicians and pathologists/cytologists, respectively.

Data from the Swedish Cancer Register of malignant oral tumours in Sweden 1958–1977 were used by Anneroth and associates [15] in an epidemiological study of malignant oral tumours in Sweden. In the present study corresponding data from the years 1960–1989 have been used as a basis for the production of more detailed and comprehensive information about oral malignant tumours in Sweden than the annual reports published by the registry. The aim of the study was to analyse the following parameters: the total number of new cases of malignant oral tumours, the total number of new cases of malignant oral tumours in various sublocations, the age-standardised incidence rate per 1 million population by site and sex, $I^{(s)}$ [24], the differences in $I^{(s)}$ between the three time periods 1960–1969, 1970–1979 and 1980–1989, the number of oral tumours of different histopathological types within each oral sublocation.

MATERIALS AND METHODS

The material in this study comprised statistical data about new primary oral malignant tumours in the oral mucosa diagnosed and reported to the Swedish Cancer Registry during 1960–1989. Squamous cell carcinoma, mixed basal cell carcinoma and squamous cell carcinoma and malignant melanoma were included in the study. In addition, other specified and unspecified malignant tumours of epithelial, mesenchymal or unspecified origin were also included. Tumours such as malignant major salivary gland tumours, lymphomas, primary malignant neoplasms in the jaws or metastases to the jaws were not included in the present material.

For the coding of the primary sites and histological types of the tumours the WHO/ICD coding systems were used [12, 13]. The following sublocations of the oral cavity were studied: lips, tongue, floor of mouth, oral cavity-other sites including the palatal, buccal and alveolar mucosa as well as the gingiva, mesopharynx, hypopharynx and pharynx unspecified. Lip cancer in this study included malignant tumours both in the vermillion border and the labial mucosa. Malignant tumours in the intra-oral region included tumours in the tongue, floor of the mouth and oral cavity-other sites.

The following data were collected for the different malignant oral tumours: (1) the total number of new cases, (2) the number of new cases in different sublocations, (3) the age-standardised incidence rate per 1 million population by site and sex, $I^{(s)}$ and (4) the number of different histopathological types within each oral sublocation. The reason why the incidence rates were expressed as rates per 1 million population instead of the more commonly used per 100 000 population was the limited number of tumours in some of the subgroups.

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

Age (years)	%	Age (years)	%
0–4	6.9	45–49	6.5
5–9	7.1	50–54	6.5
10–11	6.6	55–59	6.3
15–19	6.8	60–64	5.9
20–24	8.1	54–69	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

In order to make a comparison possible between the three 10-year periods, 1960–1969, 1970–1979 and 1980–1989, and to avoid the influence of differences in age distribution, direct standardised incidence rates were used to provide a standardised incidence rate using a standard population—the census of 1970 (Table 1) [16, 17]. If more than one primary oral tumour was detected in the same person, each tumour was registered as one case.

Statistical methods

$I^{(s)}$ were calculated using a reference standard population in Sweden (the census of 1970). Confidence intervals for the three $I^{(s)}$ were used in order to test whether there was a significant difference among the newly-reported oral malignant tumours between the time periods. A difference was considered statistically significant ($P < 0.01$) when the confidence intervals did not overlap [24].

RESULTS

Table 2 presents the total number of new cases in Sweden for the three 10-year periods, 1960–1969, 1970–1979 and 1980–1989, as well as for the whole period 1960–1989, of malignant tumours in the whole mouth–pharynx region, as well as in the different sublocations of the region. The total number of new malignant oral tumours for the period 1960–1989, 17 158, represented 1.8% (2.6% of all males and 1.0% of all females) of all new diagnosed cancers in Sweden or approximately 570 newly diagnosed cases per year. A decrease from 2.0 to 1.7% was noticed when the time periods 1960–1969 and 1980–1989 were compared. The following relative frequencies were noticed for the intra-oral region sites 0.7%, lip 0.6% and pharynx 0.5%.

If malignant tumours of the pharynx were excluded, the total number of new cases in the lips and intra-oral region for the period 1960–1989 amounted to 12 223 cases, representing 1.3% of all newly-diagnosed malignant tumours in Sweden (1.9% of all male and 0.7% of all female cancers) or approximately 400 new cases per year. If the malignant tumours of the lip were also excluded, the total number of new cases of intra-oral malignant tumours for the period 1960–1989 amounted to 6563 cases, representing 0.7% of all

Table 2. Malignant tumours in the mouth–pharynx region in Sweden in the different time periods 1960–1969, 1970–1979, 1980–1989 *and* 1960–1989. *Total number of cases, age-standardised incidence rate per 1 million population and standard deviation, by site and sex*

		Total number				Age-standardised incidence rate				Standard deviation			
Oral sublocation	Sex	1960–1969	1970–1979	1980–1989	1960–1989	1960–1969	1970–1979	1980–1989	1960–1989	1960–1969	1970–1979	1980–1989	1960–1989
Upper lip	M	73	83	109	265	2.2	2.1	2.6	2.3	0.3	0.2	0.2	0.1
	F	42	65	102	209	1.1	1.4	1.9	1.5	0.2	0.2	0.2	0.1
	M+F	115	148	211	474	1.6	1.7	2.2	1.8	0.1	0.1	0.2	0.1
Lower lip	M	1406	1570	1384	4360	40.7	40.7	32.7	38.1	1.1	1.0	0.9	0.6
	F	97	114	224	435	2.5	2.4	4.0	3.0	0.3	0.2	0.3	0.1
	M+F	1503	1684	1608	4795	20.4	19.9	16.7	19.0	0.5	0.5	0.4	0.3
Multiple parts	M			4	4			0.1					
	F		2		2								
	M+F		2	4	6								
Lip unspecified	M	70	131	127	328	2.0	3.4	3.0	2.9	0.2	0.3	0.3	0.2
	F	12	14	31	57	0.3	0.3	0.5	0.4	0.1	0.1	0.1	0.1
	M+F	82	145	158	385	1.1	1.7	1.6	1.5	0.1	0.1	0.1	0.1
Lip total	M	1549	1784	1624	4957	45.0	46.5	38.3	43.3	1.2	1.1	1.0	0.6
	F	151	195	357	703	3.9	4.1	6.4	4.9	0.3	0.3	0.4	0.2
	M+F	1700	1979	1981	5660	23.1	23.3	20.5	22.4	0.6	0.5	0.5	0.3
Tongue	M	340	497	639	1476	10.0	12.8	15.4	12.8	0.5	0.6	0.6	0.3
	F	294	366	433	1093	7.6	7.7	8.1	7.7	0.4	0.4	0.4	0.2
	M+F	634	863	1072	2569	8.7	10.2	11.7	10.2	0.3	0.3	0.4	0.2
Floor of mouth	M	80	175	316	571	2.2	4.5	7.9	5.0	0.3	0.3	0.4	0.2
	F	28	59	109	196	0.7	1.3	2.2	1.4	0.1	0.2	0.2	0.1
	M+F	108	234	425	767	1.5	2.8	4.9	3.1	0.1	0.2	0.2	0.1
Oral cavity-other	M	524	623	702	1849	15.5	16.2	16.9	16.1	0.7	0.7	0.6	0.4
sites	F	391	457	530	1378	10.1	9.7	9.8	9.8	0.5	0.5	0.4	0.3
	M+F	915	1080	1232	3227	12.6	12.7	13.1	12.7	0.4	0.4	0.4	0.2
Intra-oral region	M	944	1295	1657	3896	27.7	33.4	40.2	33.9	0.9	0.9	1.0	0.5
	F	713	882	1072	2667	18.4	18.7	20.1	19.0	0.7	0.6	0.6	0.4
	M+F	1657	2177	2729	6563	22.8	25.7	29.6	26.0	0.6	0.6	0.6	0.3
Mesopharynx	M	203	263	466	932	5.8	6.7	11.5	8.1	0.4	0.4	0.5	0.3
	F	72	131	206	409	1.9	2.9	4.5	3.11	0.2	0.3	0.3	0.2
	M+F	275	394	672	1341	3.7	4.7	7.8	5.4	0.2	0.2	0.3	0.1
Nasopharynx	M	314	318	288	920	8.7	8.1	7.1	7.9	0.5	0.5	0.4	0.3
	F	203	188	140	531	5.2	4.1	2.8	4.0	0.4	0.3	0.2	0.2
	M+F	517	506	428	1451	6.9	6.1	4.8	5.9	0.3	0.3	0.2	0.2
Hypopharynx	M	379	460	557	1396	11.0	11.9	13.6	12.2	0.6	0.6	0.6	0.3
	F	283	186	147	616	7.3	4.0	2.8	4.5	0.4	0.3	0.2	0.2
	M+F	662	646	704	2012	9.1	7.6	7.8	8.1	0.4	0.3	0.3	0.2
Pharynx unspecified	M	27	30	30	87	0.8	0.8	0.7	0.8	0.2	0.1	0.1	0.1
	F	22	14	8	44	0.6	0.3	0.1	0.3	0.1	0.1	0.1	
	M+F	49	44	38	131	0.7	0.5	0.4	0.5	0.1	0.1	0.1	
Pharynx total	M	923	1071	1341	3335	26.3	27.4	32.9	29.0	0.9	0.8	0.9	0.5
	F	580	519	501	1600	15.0	11.3	10.3	11.9	0.6	0.5	0.5	0.3
	M+F	1503	1590	1842	4935	20.4	18.9	20.8	19.9	0.5	0.5	0.5	0.3
Mouth–pharynx total	M	3416	4150	4622	12188	99.0	107.1	111.4	106.1	1.7	1.7	1.6	1.0
	F	1444	1596	1930	4970	37.2	34.1	36.7	35.8	1.0	0.9	0.9	0.5
	M+F	4860	5746	6552	17158	66.4	67.9	71.0	68.4	1.0	0.9	0.9	0.5

M, male; F, female.

new diagnosed malignant tumours in Sweden (0.8% of all males and 0.6% of all females) or approximately 220 new cases per year. In the presented figures, approximately 25 new cases per year of malignant accessory salivary gland tumours are included.

The number of cases and $I^{(s)}$ of malignant oral tumours in lip, intra-oral region and pharynx, as well as the whole mouth–pharynx region, is compiled in Table 2. If all malignant oral tumours were considered for the whole time period, the male: female ratio was 3:1. The male: female ratio changed from 2.7:1 to 3:1 between the time periods 1960–1969 and 1980–1989.

Tumours of the lip

If all new lip cancers diagnosed in the time period 1960–1969 were considered, lip cancer was almost 13 times as frequent in the lower as in the upper lip. The corresponding figures for the time periods 1970–1979 and 1980–1989 were 12 and 7.5 times, respectively. The majority of lip cancers were found in the lower lip of males. The male:female ratio, however, changed from 2:1 (1960–1969) to 1.4:1 (1980–1989) for the upper lip and from 16:1 (1960–1969) to 8:1 (1980–1989) for the lower lip.

$I^{(s)}$ of malignant lower lip tumours was 38.1 cases for males and 3 cases for females (1960–1989). The corresponding figures for upper lip tumours were 2.3 for males and 1.5 for females, respectively. If all lip cancers were considered, a statistically significant decrease in $I^{(s)}$ from 23.1 to 20.5 was found between the time periods 1960–1969 and 1980–1989. A statistically significant decrease in $I^{(s)}$ was found for males from 45 to 38.3, while females showed a statistically significant increase from 3.9 to 6.4 cases, when the corresponding time periods were compared.

Tumours of the tongue and floor of the mouth

The tongue lesions represented 77% and the floor of the mouth lesions 23% (1960–1989) of the total number of cancers in these two sites. The male:female ratios for cancer of the tongue and the floor of the mouth were 1.7:1 and 3.6:1, respectively (1960–1989). The male:female ratio changed for tumours of the tongue from 1.3:1 (1960–1969) to 1.9:1 (1980–1989) and for tumours in the floor of the mouth from 3:1 (1960–1969) to 3.6:1 (1980–1989).

$I^{(s)}$ of malignant tongue tumours was 12.8 for males and 7.7 for females (1960–1989). If all tongue cancers were considered, a statistically significant increase of $I^{(s)}$ from 8.7 to 11.7 is found between the time periods 1960–1969 and 1980–1989. A corresponding statistically significant increase was found for males from 10.0 (1960–1969) to 15.4 (1980–1989). The corresponding figures for females were almost constant, 7.7, for the whole period. $I^{(s)}$ of malignant floor of the mouth tumours showed a statistically significant increase from 2.2 (1960–1969) to 7.9 (1980–1989) for males and from 0.7 (1960–1969) to 2.2 for females (1980–1989).

Tumours of the oral cavity-other sites

The male:female ratio was 1.6:1 (1960–1989). $I^{(s)}$ was 16.1 for males and 9.8 for females and was almost constant for both males and females, 12.7, during the period 1960–1989. If all cancers in the region were considered, no statistically significant change was found when the time periods 1960–1969 and 1980–1989 were compared.

Tumours of the intra-oral region

If all cancers in the intra-oral region were considered, a statistically significant increase of the $I^{(s)}$ from 22.8 to 29.6 between the time periods 1960–1969 and 1980–1989 was found. A corresponding statistically significant increase was found from 27.7 (1960–1969) to 40.2 (1980–1989) for males, while the $I^{(s)}$ for women remained almost constant. The male:female ratio changed from 1.5:1 (1960–1969) to 2:1 (1980–1989).

Tumours of the pharynx

The male:female ratio for the whole pharynx was 2.4:1 (1960–1989), respectively. The male:female ratio for the whole pharynx changed from 1.7:1 (1960–1969) to 3.2:1 (1980–1989). The most pronounced change in the male:female ratio was observed for the hypopharynx, where the ratio changed from 1.5:1 (1960–1969) to 4.9:1 (1980–1989).

For the whole pharynx, the $I^{(s)}$ was 29 for males and 11.9 for females (1960–1989). If only pharynx cancers in males were considered, a statistically significant increase of the $I^{(s)}$ from 27.4 (1970–1979) to 32.9 (1980–1989) was found. A statistically significant decrease was found for females from 15.0 (1960–1969) to 10.3 (1980–1989). The most marked increase of $I^{(s)}$ occurred in the mesopharynx from 3.7 (1960–1969) to 7.8 (1980–1989). In this region, the increase of $I^{(s)}$ was statistically significant for both genders when the time periods 1960–1969, 1970–1979 and 1980–1989 were compared.

The histopathological types of malignant tumours in the sublocations intra-oral region and pharynx are shown in Tables 3, 4 and 5, respectively. Squamous cell carcinoma was the dominant histopathological type with a relative frequency that varied from 96.4% (lips) to 76.8% (pharynx).

Malignant melanoma

In the whole mouth–pharynx region maligant melanoma occurred in 56 cases. The most common sites were oral cavity-other sites and pharynx with a relative frequency of 62 and 12.5%, respectively.

DISCUSSION

The Swedish Cancer Registry is unique in its reliability [16]. The reporting to the registry is estimated to be close to 100% and approximately 94% of reported cases are morphologically verified. Some cases, however, are never reported to the registry, and in a number of cases specific information concerning site and histopathologic type is not available. These cases are classified as unspecified tumours and influence the register's reliability to a certain degree. In addition, some clinically undetected cancers will also remain undiagnosed as autopsy is not always performed. On the other hand, oral malignant tumours are easy to detect and, therefore, one can expect that practically all of these tumours will be included in the reports to the Swedish Cancer Registry.

The reason the reported cases for the years 1958 and 1959 were not included in the present study was that the reporting to the registry during the first 2 years was considered to be less reliable than in the following years, due to the fact that the registry was not so well developed or known during the first 2 years of its existence.

The morphological criteria for the various histopathological diagnoses vary among the pathologists, due among other things to the pathologists' training and experience. In borderline cases between benign and malignant tumours these factors might have influenced the results.

The relative frequency of the malignant tumours in the mouth–pharynx region, expressed as a percentage of the total number of malignant tumours in Sweden during the period examined (1960–1989), was 2.1%. This figure is low when compared with other countries in the world, especially in the south-east Asia region [2, 21]. A decrease of this frequency figure from 2.0 to 1.7% was noted in this study when the time periods 1960–1969 and 1980–1989 were compared.

If all malignant oral tumours were considered, males in

Table 3. Malignant lip tumours in Sweden 1960–1989 (1960–1969, 1970–1979 *and* 1980–1989). *Total number of histopathological types*

	1960–1969			1970–1979			1980–1989			1960–1989		
Histopathological type	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F
Squamous cell carcinoma	1493	132	1625	1742	173	1915	1596	321	1917	4831	626	5457
Mixed basal cell and squamous cell carcinoma	4	4	8	6	5	11	4	1	5	14	10	24
Adenoid cystic carcinoma		1	1	6	8	14	5	10	15	11	19	30
Mucoepidermoid carcinoma				7		7	2	5	7	9	5	14
Malignant salivary gland tumour of mixed type	8	2	10		1	1	1	1	2	9	4	13
Acinic cell carcinoma		1	1	1		1	1	4	5	2	5	7
Adenocarcinoma				2	1	3	1		1	3	1	4
Malignant melanoma	1	1	2	3	1	4	3	3	6	7	5	12
Other specified malignant tumours*	2	1	3	1		1	1	4	5	4	5	9
Unspecified malignant epithelial tumour	17	4	21	2	4	6	2	5	7	21	13	34
Unspecified malignant mesenchymal tumour	1		1							1		1
Unspecified malignant tumour	23	5	28	14	2	16	8	3	11	45	10	55
Total	1549	151	1700	1784	195	1979	1624	357	1981	4957	703	5660

M, male; F, female. *This group consisted of 1 hemangioma, 1 myxosarcoma, 2 rhabdomyosarcomas and 5 fibrosarcomas.

Table 4. Malignant tumours in the intra-oral region in Sweden 1960–1989 (1960–1969, 1970–1979 *and* 1980–1989). *Total number of histopathological types*

	1960–1969			1970–1979			1980–1989			1960–1989		
Histopathological type	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F
Squamous cell carcinoma	814	584	1398	1147	723	1870	1499	929	2428	3460	2236	5696
Adenoid cystic carcinoma	6	9	15	43	53	96	34	44	78	83	106	189
Mucoepidermoid carcinoma	3	8	11	32	44	76	43	39	82	78	91	169
Malignant salivary gland tumour of mixed type	40	47	87	2	3	5	5	3	8	47	53	100
Acinic cell carcinoma	1	2	3	2	3	5	1	4	5	4	9	13
Adenocarcinoma	6	10	16	9	18	27	24	20	44	39	48	87
Malignant melanoma	5	5	10	12	2	14	3	9	12	20	16	36
Other specified malignant tumours*	5	4	9	6	3	9	6	2	8	17	9	26
Unspecified malignant epithelial tumour	45	29	74	30	17	47	31	13	44	106	59	165
Unspecified malignant mesenchymal tumour	4		4	1	2	3	1	1	2	6	3	9
Unspecified malignant tumour	15	15	30	11	14	25	10	8	18	36	37	73
Total	944	713	1657	1295	882	2177	1657	1072	2729	3896	2667	6563

M, male; F, female. *This group consisted of 1 dermatofibrosarcoma, 2 liposarcoma, 1 myxosarcoma, 3 hemangiosarcomas, 2 leiomyosarcomas, 2 soft tissue alveolar sarcomas, 4 rhabdomyosarcomas and 10 fibrosarcomas.

Sweden had a higher rate of oral cancers than females, even if the male:female ratio, 3:1, is among the lowest in the world [1]. One explanation for this difference between the sexes might be a heavier exposure to such risk factors as tobacco and alcohol consumption (intra-oral cancer) and exposure to sunlight (lip cancer).

Lip cancer accounted for approximately one third of the total number of registered malignant oral tumours, which was in accordance with previously published reports [1]. There was a predominance of lower lip cancers, for the whole time period examined (1960–1989), even if a less pronounced dominance was found when the time period 1960–1969 was

Table 5. Malignant pharynx tumours in Sweden 1960–1989 (1960–1969, 1970–1979 *and* 1980–1989). *Total number of histopathological types*

Histopathological type	1960–1969			1970–1979			1980–1989			1960–1989		
	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F
Squamous cell carcinoma	631	445	1076	802	385	1187	1129	396	1525	2562	1226	3788
Adenoid cystic carcinoma	1	2	3	6	9	15	5	6	11	12	17	29
Mucoepidermoid carcinoma	1		1	2	7	9	4	4	8	7	11	18
Malignant salivary gland tumour of mixed type	2	2	4	1		1				3	2	5
Acinic cell carcinoma		1	1								1	1
Adenocarcinoma	9	2	11	19	8	27	19	3	22	47	12	59
Malignant melanoma	1		1		3	3	2	1	3	3	4	7
Other specified malignant tumours*	4	3	7	4	3	7	4	3	7	12	9	21
Unspecified malignant epithelial tumour	226	85	311	179	70	249	128	60	188	533	215	748
Unspecified malignant mesenchymal tumour		4	4	5	2	7	4	5	8	9	11	20
Unspecified malignant tumour	47	30	77	52	32	84	44	23	67	143	85	228
Total	923	580	1503	1071	519	1590	1341	501	1842	3335	1600	4935

M, male; F, female. *This group consisted of 1 chondrosarcoma, 2 alveolar soft tissue sarcomas, 2 hemangiopericytomas, 1 hemangiosarcoma, 2 leiomyosarcomas, 2 rhabdomyosarcomas and 7 fibrosarcomas.

compared with the time period 1980–1989. The causes of the high incidence rate of lower lip cancer are probably outdoor exposure and tobacco smoking [18, 19].

Concerning the incidence rate of lip cancer in males, a considerable decrease was noted, which was in accordance with similar findings in Finland [20]. A lower occurrence of lip cancer was found in females than in males, which was presumably due to females' use of cosmetic protectives [18]. In the present study, however, the male:female ratio for lower as well as for upper lip cancers changed and tended to become more evenly distributed between males and females. Even if it is difficult to explain this change, one can hypothetically suggest that the increased use of sun-screening preparations and decrease in the number of male outdoor workers might be causative factors.

The reason the male:female ratio for tongue and floor of mouth cancers changed towards a more accentuated male dominance could be the changes in tobacco and drinking habits as well as in nutrition patterns.

The increase of malignant tongue and floor of mouth tumours found in the present study was in accordance with findings reported from the U.S.A. [6], Scotland [7] and the Nordic countries [8].

For the sublocation oral cavity-other sites no major change could be noted concerning either the male:female ratio or the $I^{(s)}$. In this site there was also male dominance. In this sublocation squamous cell carcinomas occurred at a lower relative frequency, 80%, than for the other intra-oral sublocations, where the relative frequency figures were well above 90%. One explanation might be that a large amount of submucosal accessory salivary glands are found in the soft and hard palate. The proportion of accessory malignant salivary gland tumours was also higher than in the other intra-oral regions. It is difficult to find any other possible explanation for these differences. The morphological architecture of the tissues involved, including existing barrier systems, is principally the same. Hypothetically, however, the exposure to carcinogens of exogen origin such as tobacco and alcohol might vary between the different sublocations in the oral cavity.

The male dominance in the pharynx was more pronounced than in the intra-oral region. The male:female ratio changed from 1960–1969 to 1980–1989 towards a more accentuated male dominance. This was especially valid for the hypopharynx site.

The occurrence of malignant melanoma in the oral cavity occurred in only 56 cases. The most common site was oral cavity-other sites, which was in accordance with findings reported by Anneroth and associates [22], who partly used the same material as the present study.

The cause of oral cancer is basically unknown, even if some aetiological predisposing factors have been found [23]. This study partly confirms results from other epidemiological studies of oral cancer. It is obvious from this study that, with the exception of lip cancer, the $I^{(s)}$ of oral malignant tumours has increased in Sweden. Cohort studies indicate that the incidence of oral cancer will increase even in the future in many of the industrialised countries in Europe [6–11]. Incidence may increase due to early diagnosis and, therefore, the morbidity will also increase. Therefore, it is extremely important that epidemiological studies are performed in order to follow and detect early trends in prevalences and $I^{(s)}$.

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