

Oral cancer mortality in the province of Cordoba, Argentine Republic in the period 1975-2000. A comparative study with other populations

Rosana Andrea Morelatto ¹, Silvia Adriana López de Blanc ²

(1) Clinical Stomatology I and II B

(2) PhD in Dentistry. Clinical Stomatology I and II B, National University of Cordoba

Correspondence:

Dra. Silvia López de Blanc

Cátedra de Clínica Estomatológica I y II B

Facultad de Odontología

Pabellón Argentina

Ciudad Universitaria, Agencia 4

(5016) Córdoba

República Argentina

E-mail: silopez@odo.unc.edu.ar

Morelatto RA, López-de Blanc SA. Oral cancer mortality in the province of Cordoba, Argentine Republic in the period 1975-2000. A comparative study with other populations. *Med Oral Patol Oral Cir Bucal* 2006;11: E230-5.

© Medicina Oral S. L. C.I.F. B 96689336 - ISSN 1698-6946

Received: 4-04-2005

Accepted: 22-01-2006

[Click here to view the article in Spanish](#)

Indexed in:

-Index Medicus / MEDLINE / PubMed
-EMBASE, Excerpta Medica
-Indice Médico Español
-IBECs

ABSTRACT

Malignant neoplasm (MN) mortality worldwide ranks among the first four causes of death, in the 1990 decade (1-4). The aim of this work is to study the eight most frequent MN mortality rates, and especially that one caused by oral cancer (OC) in the province of Cordoba, Argentine Republic, in the period between 1975 and 2000, in order to analyze its characteristics and compare with other populations in America and Europe.

Material and Methods: The data were provided by the provincial and national Health Ministry and Globocan 2000.

Results: The highest male rates were those of Slovakia and France, prevailing lung and bronchus tumors; whereas in females the highest rate was that of breast cancer in the United Kingdom and Germany, and lung cancer in the United States. Regarding to OC in the populations under study, Slovakia and France held the highest rates for both sexes, being Cordoba and Argentina among the lowest values, especially in women. Tongue was the most frequent site in Cordoba (43.5%), followed by salivary glands (23.7%). Male prevailed over female and the oldest ages were observed in the period 1995-2000. The mortality rates by MN in all sites increased 6.6% in both sexes, and by OC 77% in women within the period under study in Cordoba.

Oral cancer is a serious problem for public health causing great morbidity and mortality, a situation that has not improved in decades. Mortality rates are an important tool towards implementation and planning of health policies and programs for cancer prevention.

Key words: Oral cancer (OC), mortality, malignant neoplasm (MN), Argentina.

RESUMEN

A nivel mundial la mortalidad por neoplasias malignas (NM), figura entre las cuatro primeras causas de muerte en la década del 90 (1-4). El objetivo del presente trabajo, es estudiar la tasa de mortalidad por las ocho NM más frecuentes y especialmente por cáncer bucal (CB) en la provincia de Córdoba, República Argentina en el período 1975-2000, analizar sus características y compararla con la de otras poblaciones de América y Europa. **Material y Métodos:** los datos se obtuvieron del Ministerio de Salud de Córdoba y Argentina y de Globocan 2000. **Resultados:** en el sexo masculino se observó que los países con más alta tasa fueron Eslovaquia y Francia, siendo los Tumores más prevalentes los de pulmón y bronquios. En las mujeres el Reino Unido, Alemania y EEUU fueron los países con tasa más alta y el Tumor más frecuente fue el de mama, excepto en EEUU donde el de pulmón lo antecede. En relación al CB en las poblaciones estudiadas, Eslovaquia y Francia fueron los países con tasa más alta para ambos sexos, estando los valores de Córdoba y Argentina entre los más bajos, especialmente en mujeres. En Córdoba la lengua fue el sitio más frecuente (43,5%), seguido

de glándulas salivales mayores (23,7%); predominó el sexo masculino y las edades promedio más altas se observaron en el período 1995-2000. Al analizar el comportamiento de las tasas de mortalidad se destacó que las NM en ambos sexos en Córdoba aumentaron el 6,6%, y la mortalidad por CB en mujeres se incrementó un 77% en el período estudiado. El CB es un serio problema de salud pública que causa gran morbilidad y mortalidad no habiendo mejorado en décadas. Las tasas de mortalidad son un instrumento importante para la diagramación de políticas y programas de salud orientados a la prevención del cáncer.

Palabras clave: *Cáncer bucal, mortalidad, neoplasias malignas, Argentina.*

INTRODUCTION

Malignant neoplasm (MN) mortality worldwide ranks among the first four causes of death in the 1990 decade, together with cardiac and cerebro-vascular diseases (1-4). Oral Cancer incidence and mortality rates vary widely across the world. Oropharyngeal and oral cancer (OC) incidence in men is higher in the Bas Rhin in France, in the south of India, where is the most common cancer, in some areas in the center and east of Europe, and in some regions of Latin America (5, 6). The highest incidence was registered in India in women with a moderate rise in mortality in the central and Eastern Europe in the 1980's and 1990's (7). Cohort studies show that OC incidence has risen in all the age groups throughout the world in the last decades (6), especially in young men in Eastern Europe (7, 8). It was reported that the risk increased in 19 of 24 European countries, with an increment from three to tenfold within a single generation (9-11); however, a decreasing tendency was observed in OC incidence in some Latin American and Caribbean countries (5). Mortality rate is an important tool that provides implicit information about incidence, diagnosis stage, solving capacity of health services, available technology and health programs to be applied, among others. However, comparisons are difficult considering that OC mortality rate and incidence data are not published using the same format (6).

The aim of the this work is to study the mortality rates of the eight most frequent MN, and especially that caused by OC in the province of Córdoba, Argentine Republic, in the period between 1975 and 2000, in order to analyze its characteristics and compare with other populations in America and Europe.

MATERIAL AND METHODS

Source

In the first stage the eight most frequent MN mortality rates were analyzed, and then the OC mortality rate. Cancer mortality data in Argentina and Córdoba, age-adjusted every one hundred thousand individuals, period 1997-2001, were provided by the Argentine Health Ministry (12). These were compared against USA and the following European countries: Spain, France, Germany, Slovakia, and United Kingdom according to Globocan 2000 (13). Death and population data in Córdoba, were provided by the Statistics Department of Córdoba Health Ministry.

Rate Calculation in Córdoba

Crude mortality rate was calculated by the following formula: $Cr = (Dn / Tp) \times 100,000$, where Cr: crude rate every 100,000 persons, Dn: population death number in a definite period of time, and Tp: total population in the same period of time. For specific sex rate the formula is $Sr = (Sdn / Sp) \times 100,000$, where Sr: Specific sex rate every 100,000 persons, Sdn: sex death number in each sex for a given population in a specific period of time, and Sp: total population of the sex under study, along the same period of time.

Rate behavior analysis

To analyze the rate behavior, five years were considered and the change percentage was assessed according to the following formula: $(T-It) \times 100/It$, where T is the average rate over each period being it crude or specific for sex, and It the 75-79 rate, considered as the initial period. The sex, age and site distribution of death for OC in Córdoba, was also under analysis. In the present study OC is defined as any MN located in lip, tongue, mouth floor, gum, palate, buccal mucosa or salivary glands (ICD-9: from 140 to 145, ICD-10: from 00 to 08); tonsils, hipo, naso and oropharynx codes were excluded (14). Up to 1996 the International Classification of Disease 9° revision (ICD-9) was used, and from 1997 it was replaced by the International Statistical Classification of Disease and health-related problems 10° revision (ICD-10). The ICD-9 used codes 140 to 145, namely: 140: lip, 141: tongue, 142: salivary glands, 143: gum, 144: mouth floor, and 145: other parts in the mouth. ICD-10 includes code 00: lip, 01: base tongue, 02: other parts and those not specified in tongue, 03: gum, 04: mouth floor, 05: palate, 06: other parts and not specified in mouth, 07: parotid gland, 08: other major salivary glands and those not specified. Due to this update nomenclature the data were analyzed in two distinct periods: 1975-1996 and 1997-2000.

RESULTS

When considering mortality caused by tumors regardless of the site, in the 1997-2001 period in male population, the countries with highest mortality rate were Slovakia and France, followed by Germany and Spain, with prevalence of lung and bronchial tubes tumors. In women, the United Kingdom, Germany and USA ranked among the countries with highest MN rates being breast neoplasia the most frequent, with the exception of USA where lung cancer was prevalent over the rest. Regarding to OC, Slovakia and France head the list with highest rate in both sexes, with Córdoba and Argentina ranking among the lowest values,

Table 1. Mortality Rates for the eight most prevalent MN, sex-specific (age adjusted, per 100,000 inhabitant), 1997-2001.

Country	All sites		Oral		Breast	Colon and rectum		Leukemia		Lung and bronchus		Prostate	Stomach		Uterus	
	Male	Female	Male	Fem	Female	Male	Fem	Male	Fem	Male	Fem	Male	Male	Fem	Cervix	other
Argentina*	148.0	93.6	1.9	0.5	20.4	14.5	9.0	3.4	3.1	35.5	7.1	16,3	9.9	3.9	4.5	6.2
Cordoba*	155.3	96.4	1.6	0.4	23.3	13.4	8.9	5.4	3.3	39.3	7.0	16.7	10.2	3.8	2.8	6.0
France	201.5	98.0	4.4	0.8	21.4	18.3	12.1	6.1	3.9	48.5	6.7	19.2	8.0	3.6	3.5	2.1
Germany**	176.6	116.9	3.2	0.8	23.7	21.7	17.0	5.7	3.9	46.2	9.6	18.4	12.9	7.8	4.2	2.1
EEUU**	161.8	116.4	1.8	0.8	21,2	15.9	12.0	6.6	4.2	53.2	27.2	17,9	4.5	2.3	3.3	2.0
Slovakia**	217.8	108.8	9.5	1.0	18.4	28.0	16.1	7.1	3.7	60.7	7.8	14.3	16.9	7.3	5.4	5.2
Spain**	176.1	85.0	3.9	0.8	18,1	17.3	11.1	5.4	3.2	49.4	4.2	15.0	12.6	6.2	2.7	2.4
United Kindom**	171.0	128.0	1.8	0.8	26,8	18.7	13.8	4.9	3.3	48.6	21.1	18,5	10.1	4.8	3.9	1.7
Sweden	137.9	104.0	1.3	0.7	17.5	14.4	11.5	5.1	3.3	22.6	12.6	27.3	7.4	4.0	2.9	2.0

*1997-2001 National Health Ministry of Argentina (12).

**2000 Jemal et al (13)

Table 2. Average mortality rate for cancer in all sites for both sexes, in Cordoba Province period 1975-2000 and change percentage with respect to the first period.

75-79	80-84	Change %	85-89	Change %	90-94	Change %	95-00	Change %
159.3	158.7	-0.38	169.7	6.53	169.8	6.6	169.8	6.6

Table 3. Death number for oral cancer. Sex and age distribution according to the location, in Cordoba Province, period 1975-1996. (ICD-9) Code.

Location	Male		Female		
	Number of deaths (%)	Mean Age \pm SD	Number of deaths (%)	Mean Age \pm SD	M:F
Lip	45 (6.6%)	64 \pm 10	10 (6.1%)	73 \pm 12	4.5:1
Tongue	308 (45.2%)	60 \pm 9	60 (36.4%)	61 \pm 16	5:1
Salivary Gland	155 (22.7%)	64 \pm 10	50 (30.3%)	64 \pm 15	3:1
Gum	15 (2.2%)	61 \pm 15	5 (3%)	57 \pm 10	3:1
Mouth floor	48 (7%)	58 \pm 11	11 (6.7%)	65 \pm 10	4:1
Other locations	111 (16.3%)	60 \pm 12	29 (17.6%)	65 \pm 12	4:1
Total	682 (100%)	61 \pm 11	165 (100%)	64 \pm 12	4:1

especially in women (Table 1).

When analyzing the change percentage in the MN mortality rate regardless of site in the province of Cordoba in 1975-2000 period, a 6.6% increment was observed (Table 2).

Tables 3 and 4 show the number of deaths by OC in the province of Cordoba in the 1975-1996 and 1997-2000 periods respectively. Over a total of 1005 deaths in both sexes, the most frequent site was the tongue (43.5%), followed by the salivary glands (23.7%). When considering sex and age in death distribution by OC, male predominated, except in the 1997-2000 period when the M / F ratio comes closer to one, especially in the tongue that changed from 5 to 2.6. Regarding to age, mouth tumors ranked from 22 to 87 years with a mean of 59.5. Older ages can be observed in the second period in all the sites for both sexes, especially in lips in women. In the first period the youngest average age was 57.7 for men with floor of the mouth tumors and 57.5 for women with gum lesions (Table3), whereas in the second period the lowest ages were found in the tongue and mouth floor (Table 4).

Change percentage in mortality rate was observed for OC, specifically for sex and in the period 1975-2000 (Fig.1). There was a 59% increment in men until 1995 that decreased in the last period down to a value of the first period studied. In women the increment was gradual reaching 77% in 95-2000 period (Table 5).

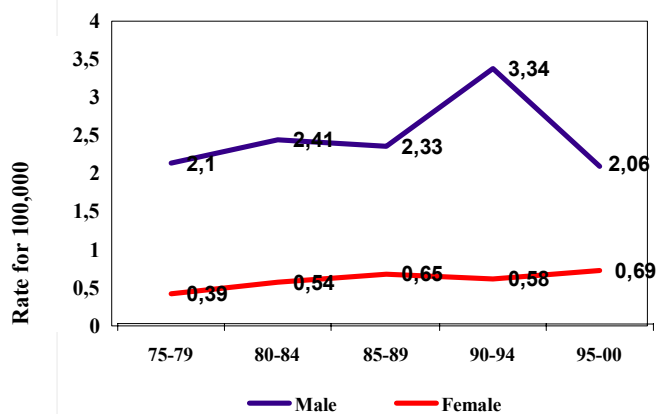


Fig. 1. Mortality rate for oral cancer by gender in Cordoba province, period 1975-2000 (per 100,000 inhabitants).

Table 4. Death number for oral cancer. Sex and age distribution according to the location, in Cordoba Province, period 1997-2000. (ICD-10) Code.

Location	Male		Female		
	Number of deaths (%)	Mean Age \pm SD	Number of deaths (%)	Mean Age \pm SD	M:F
Lip	7 (5.8%)	72 \pm 9	2 (5.3%)	84 \pm 12	3.5:1
Tongue	50 (41.7%)	61 \pm 11	19 (50%)	71 \pm 11	2.6:1
Parotid	23 (19.2%)	66 \pm 13	10 (26.3%)	73 \pm 10	2.3:1
Gum	-	-	-	-	-
Mouth floor	15 (12.5%)	61 \pm 11	3 (7.9%)	74 \pm 17	5:1
Other Locationiz	10 (8.3%)	62 \pm 14	0	0	10:0
Palate	15 (12.5%)	66 \pm 10	4 (10.5%)	74 \pm 8	3:1
Total	120 (100%)	65 \pm 11	38 (100%)	76 \pm 12	3:1

Table 5. Average mortality rate for oral cancer by gender, in Cordoba Province period 1975-2000 and change percentage with respect to the first period.

Sex	75-79	80-84	Change %	85-89	Change %	90-94	Change %	95-00	Change %
Male	2.10	2.41	14.8%	2.33	10.9%	3.34	59%	2.06	-1.9%
Female	0.39	0.54	38.5%	0.65	66.7%	0.58	48.7%	0.69	77%

DISCUSSION

While MN mortality regardless of site diminished by 1.1% average per year (13) in USA during the period 1992-1998; in Cordoba the rate increased by 6.6% in the period 1975-2000 and is higher than that for Argentina (Tables 1 and 2).

In the present work, when referring to OC, the codes considered were: 140-145 of the CIE-9 following Shiboski et al (14). When comparing with other authors we found that Moore et al studied only some sites in the mouth: 143-145 (6), others include oropharynx: 141-146 (15), a significant number of authors studied mouth and pharynx cancer: 140-149 (5, 7, 8, 11, 16-18) and in the last group are those that exclude lip, salivary glands, nasopharynx and hypopharynx (19, 20). The comparison with our findings is difficult due to the difference in the formats used by different authors.

OC mortality rate in men increased steadily until 1994 where it reached 59% higher than in the period 1975-1979. The phenomenon is similar to that observed in oropharynx cancer in some countries in Europe, such as Ukraine, Estonia, Hungary and Russia (7); in Cordoba however from 1995 a diminution in mortality was recorded, a finding difficult to interpret but also observed in other populations such as San Pablo, Brazil (17), Switzerland, Sweden, Italy, and France (5,7).

The age of OC patients was higher in the last period studied (Table 3), which correlates with the observations of Su et al in Japan (18). This is most likely explained by the National Institute of Statistics and Census (INDEC) (21) who considers that if the present demographic tendencies remain the same, cancer incidence and mortality in Argentina will continue moving towards older age groups (22). This is due to the increase in life expectancy from 68.44 to 69.55 years for men and 75.69 to 75.75 years for women over the period 1995-2000 (1). The current tendency in Europe is toward an increase OC incidence in young adults, especially in tongue (23, 24). This observation could not be correlated with Argentina, due to the absence of official records of OC incidence in this country. OC is a disease that most predominantly affects males (25), there is however evidences showing an increase in oropharynx cases in middle-aged women, as described for central and eastern European countries (Slovakia, Belgium, Greek, and Czech Republic) over the period 1994-1999 (7). In Cordoba, although with a relatively low rate, a gradual increase can be observed reaching up to 77% higher in the period 95-2000 than in the first period under study (Table 5). These tendencies probably indicate a change in women habits, such as the increase in smoking or drinking alcohol (7, 26-29). A marked increment in alcohol and tobacco consumption has been observed lately in Argentina, reaching up to 30% to 50% in males economically active, together with an even higher percentage of adolescents showing this addictive behavior (30). An increment in MN incidence in the near future can be inferred from these data.

When analyzing OC sites, the tongue was the most frequent in males older than 50 years, which was similar to most of the studies (14, 15, 31, 32). In the last period under analysis

(1995-2000) an increase in mortality rate in women showed a striking increase in lip tumors, where the M:F ratio shifted from 4.5:1 to 3.5:1 and in tongue from 5:1 to 2.6:1. Lip cancer was the most frequent MN in the oral cavity and the predominant histological type is squamous cell carcinoma, representing 95% of the cases (33). Most of them occur in the lower lip semimucosa in white men chronically exposed to sun, in general with a good prognostic. There are also other MN that can take place in the lip, such as adenocarcinomas, more frequent in the upper lip in women, with a less favorable prognostic than that of squamous cell carcinoma. In the present work MN in lip was found to be 6.5% in men and 6% in women of the total deaths for OC respectively (Tables 3 and 4). Because these data could not be compared against incidence and histological type, the high percentage found in women can be attributed to the increase in solar exposure due to change of habits, and to a higher prevalence of adenocarcinomas as it was observed by other authors (34). Although an increase in incidence can not be directly related to an increase in mortality, it is important to notice the low mortality rate for MN in gum, considering that this is one of the most frequent sites affected, probably because this site is usually labelled as "other sites" (35-40). Argentine population was estimated around 36 millions in 2001, with an urban population of 88.6% in 1996 (1). Cordoba is a mediterranean province, with 3 million inhabitants, 50% of whom are located in the capital city where there are numerous metallurgy and car related industries. There are regions in this province where the drinkable water contains high amounts of arsenic, which causes chronic hydro-arsenicism regionally endemic (HACRE in Spanish), favoring skin and oral cancer (41, 42). Table 1 shows that cancer mortality in all sites is higher in Cordoba than in Argentina. Because the differences in mortality rate between periods of time and geographic areas should be interpreted in terms of changes in exposure to risk factors (6), it would be of fundamental importance to go deeper into incidence and mortality studies in our province and relate them to the factors than may influence cancer etiopathology.

OC is a serious public health problem that causes great morbidity and mortality and which has not improved in decades. It is therefore a true challenge in various regions of the world. The prognostic depends greatly on an early diagnosis of hazardous lesions in mouth; therefore keeping health professionals well trained is of utmost importance, particularly dentists and clinicians, in order to reduce OC devastating consequences over the world.

REFERENCES

1. PAHO. Panamerican Health Organization. La Salud en las Américas. 1998;2:26-48.
2. Gajalakshmi V, Peto R, Kanaka TS, Jha P. Smoking and mortality from tuberculosis and other diseases in India: retrospective study of 43000 adult male deaths and 35000 controls. *Lancet* 2003;362:507-15.
3. Ministério da Saúde. Sistema de Informação sobre mortalidade: Dados de declaração de óbito 1979-1996 (CD-ROM). Brasília, DF, Ministério da Saúde, 1998.
4. Jemal A, Murria T, Ward E, Samuels A, Tiwari RC, Ghafoor A et al. Cancer Statistics, 2005. *CA Cancer J Clin* 2005;55:10-30.
5. Franceschi S, Bidoli E, Herrero R, Muñoz N. Comparison of cancers of the oral cavity and pharynx worldwide: etiological clues. *Oral Oncol* 2000;36:106-15.
6. Moore SR, Johnson NW, Pierce AM, Wilson DF. The epidemiology of mouth cancer: a review of global incidence. *Oral Dis* 2000;6:65-74.
7. La Vecchia C, Lucchini F, Negri E, Levi F. Trends in oral cancer mortality in Europe. *Oral Oncol* 2004;40:433-9.
8. La Vecchia C, Tavani A, Franceschi S, Levi F, Corrao G, Negri E. Epidemiology and prevention of oral cancer. *Oral Oncol* 1997;33:302-12.
9. Macfarlane GJ, Boyle P, Evstifeeva TV, Robertson C, Scully C. Rising trends of oral cancer mortality among males worldwide: the return of an old public health problem. *Cancer Causes Control* 1994;3:259-65.
10. Macfarlane GJ, Boyle P, Scully C. Oral cancer in Scotland: changing incidence and mortality. *Brit Med J* 1992;305:1121-3.
11. Robinson K, Macfarlane G. Oropharyngeal cancer incidence and mortality in Scotland: are rates still increasing? *Oral Oncol* 2003;39:31-6.
12. Matos E, Loria D, Zengarini N. Atlas de Mortalidad por Cáncer (Argentina 1997-2001) Publicación del Ministerio de Salud de la Nación 2003;2:13-6.
13. Jemal A, Thomas A, Murray T, Thun M. Cancer Statistics, 2002. *CA Cancer J Clin* 2002;52:23-47.
14. Shiboski CH, Shiboski SC, Silverman S Jr. Trends in oral cancer rates in the United States. *Comm Dent Oral Epidemiol*.2000;28:249-56.
15. Nieto A, Ruiz Ramos M. Rising trends in oral cancer mortality in Spain, 1975-94. *J Oral Pathol Med* 2002;31:147-52.
16. Cox B, Taylor K and Treasure E. Trends in oral cancer by subsite in New Zealand. *Oral Oncol* 1995;2:113-7.
17. Wünsch Filho V. The epidemiology of oral and pharynx cancer in Brazil. *Oral Oncol* 2002;38:737-46.
18. Su W-Z, Tohna I, Kawamura T, Tamakoshi A, Wakai K, Aoki R et al. Trends in site-specific mortality from oral and pharyngeal cancer among Japanese males, 1950-94. *Oral Oncol* 1999;35:9-16.
19. Mackenzie J, Ah-See K, Thakker N, Sloan P, Maran A, Birch J, Macfarlane G. Increasing incidence of oral cancer amongst young persons: what is the etiology? *Oral Oncol* 2000;36:387-9.
20. Hindle I, Downer M, Speight P. The epidemiology of oral cancer. *British J Oral Maxillof Surg* 1996;34:471-6.
21. INDEC: Instituto Nacional de Estadísticas y Censos Argentina, 2002. Available from <http://www.indec.gov.ar>.
22. PAHO. Panamerican Health Organization. Las Condiciones de Salud de las Américas 1994;1:233-50.
23. Slotman GJ, Swaminathan AP, Rush BF. Head and neck cancer in a young age group: high incidence in black patients. *Head and Neck Surg* 1983;5:293-8.
24. Hindle I, Downer MC, Speight PM. Necessity for prevention strategies in oral cancer. *Lancet* 1994;343:178-9.
25. Prince S, Bailey BMW. Squamous carcinoma of the tongue:review. *Brit J Oral Maxillof Surg* 1999;37 :164-74.
26. Macfarlane GJ, Evstifeeva TV, Robertson C, Boyle P, Scully C. Trends of oral cancer mortality among females worldwide. *Cancer Causes Control* 1994;3:255-8.
27. Boyle P, Leon ME, Maisonneuve P, Autier P. Cancer control in women. Update 2003. *Int J Gynecol Obstet* 2003;83:179-202.
28. Dalitsch W, Vazirani S. Oral cancer in women. A study of the increasing incidence. *The Am J Surg*.1959;98:869-74.
29. Cusumano RJ, Persky MS. Squamous cell carcinoma of the oral cavity and oropharynx in young adults. *Head and Neck Surg* 1988;10: 229-34.
30. PAHO: Panamerican Health Organization. Available from: <http://www.publications.paho.org>
31. Moore SR, Johnson NW, Pierce AM, Wilson DF. The epidemiology of tongue cancer: a review of global incidence. *Oral Dis* 2000;6:75-84.
32. Mcfarlane GJ, Boyle P, Scully C. Rising mortality from cancer of the tongue in young Scottish males. *The Lancet* 1987;912.
33. Izarzugaza MI, Esparza H, Aguirre JM. Epidemiological aspects of oral and pharyngeal cancers in the Basque Country. *J Oral Pathol Med* 2001;30:521-6.
34. Luna-Ortiz K, Güemes-Meza A, Villavicencio-Valencia V, Mosqueda-Taylor A. Lip cancer experience in Mexico. An 11-year retrospective study. *Oral Oncol* 2004. (in press) <http://www.indec.gov.ar>.
35. Barasch A, Gofa A, Krutchkoff D, Eisenberg E, Farmington C. Squamous cell carcinoma of the gingiva. A case series analysis *Oral Surg Oral Med Oral Pathol* 1995;80:184-7.
36. Blot WJ, McLaughlin JK, Winn DM. Smoking and drinking in relation to oral and pharyngeal cancer. *Cancer Res* 1988; 48:3282-7.
37. Chen J, Katz RV, Krutchkoff DJ. Intraoral squamous cell carcinoma. *Cancer* 1990;66:1288-96.
38. Keller AZ, Terris M. The association of alcohol and tobacco with cancer of the mouth and pharynx. *Am J Public Health* 1965;55:1578-85.
39. Krutchkoff DJ, Chen J, Eisenberg E, Katz RV. Oral cancer: a survey of 566 cases from the University of Connecticut Oral Pathology Biopsy Service, 1975-1986. *Oral Surg Oral Med Oral Pathol* 1990;70:192-8.
40. Krolls SO, Hoffman S. Squamous cell carcinoma of the oral soft tissues: statistical analysis of 14253 cases by age, sex and race of patients. *J Am Dent Assoc* 1976;92:571-4.
41. Brown J, Fan A. Arsenic: risk assesment for california drinking water standars. *J Hazard Mat* 1994;39:149-59.
42. Alain G, Tousignant J, Rozenfarb E. Chronic arsenic toxicity. *Int J Dermatol* 1993;32:899-901.

Acknowledge: the authors want to said thanks to Mrs. Lina Romero de Carranza for her technical assistance in the mortality rates elaboration.