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Influence of Educational Level, Stage, and Histological Type on Survival of Oral Cancer in a Brazilian Population

A Retrospective Study of 10 Years Observation

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Abstract: The mortality rate associated with oral cancer is estimated at approximately 12,300 deaths per year, and the survival rate is only 40% to 50% for diagnosed patients and is closely related to the duration of time between disease perception and its diagnosis and treatment. Socio-economic risk factors are determinants of the incidence and mortality related to oral cancer. We conducted a retrospective, cross-sectional study of 573 records of patients with oral cancer at Haroldo Juaçaba Hospital – Cancer Institute of Ceará from 2000 to 2009 to evaluate the influence of socioeconomic factors on survival and epidemiological behavior of this neoplasia in a Brazilian population. In this study, patients with oral cancer were males greater than 60 years of age, presented squamous cell carcinoma in the floor of mouth and were characterized by low education levels. A total of 573 lesions were found in oral cavities. Cox proportional hazards regression model showed that the histological type, tumor stage, and low degree of education significantly influenced survival. A lower patient survival rate was correlated with a more advanced stage of disease and a worse prognosis. Squamous cell carcinoma is associated with a higher mortality when compared with other histological types of malign neoplasia.

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Abbreviations: RT = radiotherapy, SCC = squamous cell carcinoma, TNM = tumor size lymph node metastasis, WHO = World Health Organization.

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INTRODUCTION

Cancer is a disease of great concern worldwide due to its high incidence and mortality. The World Health Organization (WHO)[1] has estimated that in 2030, 27 million new cases and 75 million people will be with cancer. The greatest effect of this increased focus on oral cancer in underdeveloped countries is that various neoplasms predominate.[2] Oral cancer is 1 of the 10 most frequently occurring cancers globally, and its incidence displays an increasing trend worldwide.[2–4] In Brazil, there is an estimated risk of 11.54 and 3.92 new cases in every 100 thousand men and women, respectively.[1]

Studies show that men over 50 years of age are more affected by oral cancer. The primary tumor site is the tongue, and the most common histological type is squamous cell carcinoma (SCC).[5] With an estimated 12,300 deaths per year, oral cancer has a 5-year survival rate of approximately 40% to 50%.[6] Despite being heavily influenced by the tumor stage, the survival of oral cancer patients is influenced by many factors of a social nature such as the time between disease perception, its diagnosis and treatment, access to health-care services, educational level and occupation of the patient, behavioral/cultural factors, exposure to risk factors such as chewing tobacco and some specific topographical distributions.[7,4,8–12]

Characterization of survival of patients with oral cancer and the contributing factors is based on data on the incidence of the disease and mortality. This data should be constantly updated to provide managers and health planners, with new information regarding the disease, frequency, and distribution.[10] Wong et al[10] (Thailand) showed that socio-demographic factors such as marital status and religious belief may influence survival and prognosis of patients with oral cancer independent of other clinical factors. Although several studies evaluated the influence of these social factors on survival of oral cancer,[7,4,8–12] the studies do not make an assessment investigating the relationship between their variables.

Thus, the objective of this study is to determine whether clinical features, histopathology, and socio-economic status influences the survival of patients with oral cancer treated at a tertiary institution in Brazil.

MATERIALS AND METHODS

Study Design

In this observational, retrospective, cross-sectional, quantitative study, we reviewed the medical records of 573 patients with oral malignant neoplasms treated at the Haroldo Juaçaba Hospital (Cancer Institute of Ceará).

Description of Variables

During the period between 2000 and 2009, a convenience sample was obtained that included patients with oral cancer.

Socio-demographic data such as age, sex, education, race/color, type of admission to hospital (private health system or public health system) and clinical features and histopathology data, such as the tumor histological type, location in the oral cavity, tumor size lymph node metastasis, stage of the tumor, and survival following treatment completion were assessed. The level of education was obtained through direct interviews with the patients noted in medical records held at the time of entry in the hospital.

The location of the primary tumor was classified according to WHO[13] criteria (lip, gingiva, anterior third of the tongue, hard palate, floor of the mouth and other parts, and parts not identified in the mouth) and the histological types were grouped into 2 groups: SCC and non-SCC (see results).

The stage of the tumor was defined according to the proposition of WHO:[13] T is related to the tumor size, N indicates the lymph node involvement, and M is distant metastases. Regarding stages, it was considered stage I, stage II, stage III, or stage IV encompassing the IVA, IVB, and IVC stages.

Survival (months) was determined based on the difference between the date of the start of treatment and the date of death.

Statistical Analysis

Data were analyzed using statistical software SPSS (Statistical Package for Social Sciences) for Windows version 17.0, with a confidence level of 95% ($P < 0.05$).

Categorical data were analyzed by a Chi-square test with 95% confidence intervals. Survival analysis was investigated by Chi-square test, Kaplan–Meier method, and Cox regression model of survival.

Ethical Correlations

This study conformed to ethical principles and was accepted by the ethics committee under protocol 011/2011.

RESULTS

Exploratory Analysis

Within the period evaluated, 573 malignant lesions were determined. Of these, 63.9% occurred in males and 207 (36.1%) in females. The male:female ratio (1.8:1.0) was statistically significant ($P < 0.001$). The age distribution revealed a significantly greater proportion of patients in the 61 to 70-year-old age group (n = 144, 25.1%); ($P < 0.001$), and there were no cases of malignant tumor of the mouth in patients younger than 21 years. The 2 main sites of involvement were the mouth floor (n = 153, 26.7%) and tongue (n = 145, 25.3%) ($P < 0.001$) (Table 1).

The racial distribution showed a higher prevalence of lesions in patients of mixed race (n = 347, 60.6%) ($P < 0.001$). There was no difference regarding the number of patients in the metropolitan area compared with countryside ($P = 0.496$) (Table 1).

Regarding education level, 169 (n = 37.1%) patients said they were illiterate and 188 (n = 41.3%) had incomplete primary school. These values were significantly higher compared with groups categorized by level of education ($P < 0.001$). The public health system (n = 402, 71.0%) was the main agreement by which patients were admitted to the hospital ($P < 0.001$) (Table 1).

TABLE 1. Clinical, Demographic, Socioeconomic, and Therapeutic Profile of Patients With Oral Cancer Treated at the Haroldo Juaçaba Hospital (Cancer Institute of Ceará) (2000–2009)

	N	%	95% IC	*P*-Value
Sex				
Males	366	63.9%	59.8–67.8	<0.001
Females	207	36.1%	32.2–40.2	
Age				
21–30	8	1.4%	0.6–2.7	<0.001
31–40	29	5.1%	3.4–7.2	
41–50	77	13.4%	10.7–16.5	
51–60	124	21.6%	18.3–25.2	
61–70	144*	25.1%	21.6–28.9	
71–80	113	19.7%	16.5–23.2	
81–90	67	11.7%	9.2–14.6	
91–100	11	2.0%	1.0–3.4	
Race				
Mixed	347*	60.6%	56.4–64.6	<0.001
White	206	36.0%	32.0–40.0	
Others	20	3.4%	2.1–5.3	
Origin				
Metropolitan region	297	52.0%	47.8–56.2	0.496
Countryside	274	48.0%	43.8–52.2	
Education level				
Illiterate	169***	37.1%	32.7–41.0	<0.001
Incomplete primary school	188***	41.3%	36.7–46.0	
Completed primary school	49	10.5%	7.9–13.7	
High school	34	7.5%	5.2–10.3	
Higher education	16	3.6%	2.0–5.5	
Covenant				
Public health system	402***	71.0%	66.2–73.9	<0.001
Private health system	171	29.0%	26.1–33.8	
Location				
Floor of mouth	153***	26.7%	23.1–30.5	<0.001
Tongue	145***	25.3%	21.8–29.1	
Hard palate	105	18.3%	15.2–21.7	
Lip	40	7.0%	5.0–9.4	
Gum	16	2.8%	1.6–4.5	
Others	114	19.9%	16.7–23.4	
Size of tumor				
T1	24	8.6%	5.6–12.5	<0.001
T2	65	23.3%	18.5–28.7	
T3	76	27.2%	22.1–32.9	
T4	114***	40.9%	35.0–46.9	
Lymph node				
N0	167***	59.9%	53.8–65.7	<0.001
N1	49	17.6%	12.3–22.5	
N>1	63	22.6%	17.8–27.9	
Metastasis				
M0	277***	99.3%	97.4–99.9	<0.001
M1	2	0.7%	0.1–2.6	
Stage				
I	19	6.4%	3.9–9.8	<0.001
II	53	17.9%	13.7–22.8	
III	75	25.3%	20.5–30.7	
IV	149***	50.4%	44.4–56.2	
Treatment				
Surgery	107	18.7%	17.7–24.5	<0.001
Surgery + RT	110	19.2%	18.3–27.7	
RT	81	14.1%	13.0–19.6	
RT + CT	46	8.0%	6.8–12.0	
CT	17	3.0%	2.0–5.4	
Surgery + RT + CT	16	2.8%	1.8–5.1	
Surgery + CT	5	0.9%	0.3–2.3	
No treatment	191***	33.3%	33.7–42.4	

* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$. Chi-square. CT = chemotherapy, RT = radiotherapy.

The majority of the tumors were diagnosed in floor of mouth (n = 153, 26.7%) and tongue (n = 145, 25.3%) ($P < 0.001$), as size T4 (n = 114, 40.9%) ($P < 0.001$), with no lymph nodes (N0) affected (n = 167, 59.9%) ($P < 0.001$) and no metastasis (M0) identified (n = 277, 99.3%) ($P < 0.001$). The most prevalent clinical stage was stage IV with 149 (50.4%) cases ($P < 0.001$). Noncompletion of treatment (n = 191, 33.3%) was the approach most significantly adopted ($P < 0.001$) (Table 1).

SCC (n = 524, 91.4%) was the main histological type ($P < 0.001$) in relation to non-SCC (n = 49, 8.6%). This group comprised adenoid cystic carcinoma (n = 18, 3.2%), adenocarcinomas (n = 6, 1.1%), cystadenocarcinomas (n = 4, 0.7%), undifferentiated neoplastic malignancy (n = 5, 0.8%), malignant melanoma and clear cell adenocarcinoma (n = 3, 0.5%), malignant large B-cell lymphoma, mucinous adenocarcinoma (n = 2, 0.3%), and acinic cell carcinoma, epithelial-myoepithelial carcinoma, carcinosarcoma, myoepithelioma, malignant non-Hodgkin lymphoma, and T-cell lymphoma (n = 1, 0.2%).

Ten-Year Survival

The 10-year survival rate was 56.5%. We observed that variables non-SCC (n = 27, 84.4%, $P = 0.001$), patients in the 3rd decade of life (n = 5, 100.0%, $P = 0.037$), multiracial ($P = 0.018$), surgery alone (n = 53, 67.9%, $P = 0.002$), or surgery combined with radiotherapy (RT, n = 48, 70.6%, $P = 0.001$) showed average survival rate higher compared with other variables (Chi-square test). Clinically, patients with T1 tumor (n = 20, 90.9%, $P = 0.001$), stage I (n = 16, 94.1%, $P < 0.001$) showed significantly higher survival percentages. The lymph node involvement only influenced the survival rate ($P = 0.049$), and the presence of distant metastases was not related to the survival percentage ($P = 0.294$) (Table 2, Fig. 1).

The long-rank Mantel–Cox test showed that the variables resulting in higher survival rates were non-SCC patients (99.0 ± 7.2) ($P = 0.002$) in the 3rd decade of life ($P = 0.034$) and multiracial patients (79.2 ± 8.3) ($P = 0.018$). Other factors producing higher survival rates included only surgical treatment (81.8 ± 6.4) ($P = 0.005$), surgery combined with RT (80.9 ± 6.0) ($P = 0.005$), T1 tumor gradation (96.8 ± 7.5) ($P = 0.034$), and stage I classification (101.2 ± 6.5) ($P = 0.005$).

In a Cox proportional hazards regression model, categorization factors that significantly influenced survival were histological type ($P = 0.017$), education level of the patient ($P = 0.022$), and tumor stage ($P < 0.001$). Sex ($P = 0.336$), age ($P = 0.106$), race ($P = 0.126$), origin ($P = 0.379$), covenant ($P = 0.157$), location ($P = 0.587$), size of tumor ($P = 0.211$), lymph node metastasis ($P = 0.080$), distant metastasis ($P = 0.217$), and treatment ($P = 0.854$) did not influence survival.

Evaluation of Histological Type

The number of SCCs in men (n = 349, 66.6%) was 3.7 (IC95% = 2.0–6.9) times greater than the number of SSC in women (n = 175, 33.4%) ($P < 0.001$). The non-SCC were diagnosed specifically at the age groups of 21 to 30 (n = 6, 12.2%) and 31 to 40 (n = 10, 20.4%) ($P < 0.001$) (Table 3).

The race ($P = 0.795$), the origin ($P = 0.452$), and the agreement of admission to hospital did not significantly influence the distribution of these 2 histological types. However, in relation to education, SCC (n = 162, 38.8%) was diagnosed significantly more than non-SCC (n = 7, 18.4%) in illiterate individuals ($P = 0.007$) (Table 3).

Clinically, the SCC showed a higher prevalence in the floor of the mouth (n = 150, 28.6%), tongue (n = 141, 26.9%), and lip (n = 38, 7.3%), while the non-SCC showed high prevalence in the hard palate (n = 25, 51.0%) and other sites (n = 15, 30.6%) ($P < 0.001$) (Table 3).

The SSC was diagnosed significantly more often as size T3 (n = 75, 28.4%) and T4 (n = 113, 42.8%) ($P < 0.001$). The involvement of more than 1 lymph node showed a greater association with SSC (n = 63, 23.8%) than non-SCC (n = 0, 0.0%) ($P = 0.022$), but the presence of metastases was not associated with the histological type ($P = 1.000$). The non-SCC had a higher prevalence of diagnosis in stage I (n = 5, 31.3%) and II (n = 8, 50.0%). In turn, SCC tumors were diagnosed more commonly in stage III (n = 73, 28.4%) and IV (n = 125, 48.7%) ($P < 0.001$) (Table 3).

Evaluation of Education

Regarding schooling, female patients showed a high prevalence among illiterate individuals (n = 82, 48.5%) and completion of only grade school (n = 20, 41.7%). The proportion of men was significantly greater among individuals with incomplete primary school (n = 136, 72.3%), high school (n = 24, 75.0%), and higher education (n = 12, 75.0%) ($P = 0.001$) (Table 4).

The age of the patient showed an inverse association with the degree of schooling ($P < 0.001$). The number of multiracial patients was significantly larger in the illiterate group (n = 123, 72.8%) ($P < 0.001$), and the patients from countryside were illiterate (n = 106, 63.1%) ($P = 0.014$) (Table 4).

There was a higher prevalence of public health system patients among the illiterate individuals (n = 131, 77.5%) and the group with an incomplete primary school (n = 137, 72.9%) ($P < 0.001$) (Table 4).

The tumor size was inversely associated with the level of education. Illiterate patients (n = 44, 55.7%), with an incomplete primary school level (n = 36, 38.7%) and completed primary school (n = 10, 41.6%) showed an increased proportion of T4 tumors, while patients with a higher education level (n = 0, 0.0%), showed a high frequency of tumors with sizes of T2 (n = 4, 66.7%) and T1 (n = 2, 33.3%) ($P = 0.011$) (Table 4).

Tumor stage of IV was significantly more prevalent in all educational levels except the group of higher education ($P = 0.032$) (Table 4).

The main therapeutic decision in illiterate patients (n = 82, 48.4%) and incomplete primary school (n = 60, 32.8%) was therapeutic abstention, whereas patients with completed primary school were mainly treated with surgery (n = 12, 25.0%). High school patients were treated significantly more with surgery and RT (n = 10, 29.4%), and higher education patients were treated only with RT (n = 4, 37.5%) ($P = 0.013$) (Table 4).

Assessment of Stage

Female patients were diagnosed mainly as stage I (n = 13, 68.4%), while men were diagnosed significantly more often as stage II (n = 39, 73.6%), III (n = 45, 60.0%), and IV (n = 99, 66.4%) ($P = 0.009$). There was a direct association between age and stage of the tumor ($P = 0.002$) (Table 5).

The patient's origin ($P = 0.692$) and the method of admission to the hospital ($P = 0.170$) did not influence the tumor staging. However, the therapy most frequently adopted was abstention from treatment for stage I (n = 3, 42.1%), RT alone

TABLE 2. Ten-year Survival of Patients Diagnosed With Oral Cancer in Haroldo Juaçaba Hospital (Cancer Institute of Ceará) (2000–2009)

	Total Survival (&) in 10 years	*P*-Value*	Total Survival (months) in 10 years	*P*-Value†
Total	258 (56.7%)		67.1 ± 2.7	
Histologic type				
SCC	228 (55.1%)	0.001	64.7 ± 2.7	0.002
Non-SCC	27 (84.4%)**		99.0 ± 7.2††	
Sex				
Males	159 (55.0%)	0.118	65.7 ± 3.3	0.405
Females	96 (62.7%)		69.5 ± 4.3	
Age				
21–30	5 (100.0%)*	0.037		0.034
31–40	16 (66.7%)		79.2 ± 8.2	
41–50	37 (66.7%)		75.7 ± 5.4	
51–60	55 (56.7%)		71.3 ± 4.4	
61–70	60 (54.1%)		69.4 ± 4.2	
71–80	55 (61.1%)		75.0 ± 4.5	
81–90	26 (46.4%)		62.5 ± 9.8	
91–100	1 (12.5%)		50.0 ± 15.1	
Race				
Mixed	147 (52.9%)	0.294	63.8 ± 3.4	0.018
White	95 (60.1%)		79.2 ± 8.3†	
Others	4 (66.7%)		70.9 ± 4.5†	
Origin				
Metropolitan region	129 (55.1%)	0.626	66.5 ± 4.0	0.413
Countryside	124 (57.4%)		67.6 ± 3.6	
Education level				
Illiterate	58 (42.3%)	0.010	54.5 ± 4.6	0.001
Incomplete primary school	81 (54.4%)		70.0 ± 4.3	
Completed primary school	19 (50.0%)		48.0 ± 6.0	
High school	13 (65.0%)		72.7 ± 8.7	
Higher education	12 (85.7%)*		99.3 ± 9.6††	
Covenant				
Public health system	188 (57.0%)	0.696	63.5 ± 3.0	0.323
Private health system	67 (54.9%)		70.5 ± 4.8	
Location				
Floor of mouth	68 (56.7%)	0.871	66.0 ± 5.3	0.575
Tongue	66 (55.0%)		65.5 ± 5.3	
Hard plate	44 (55.7%)		60.6 ± 6.1	
Lip	21 (67.7%)		93.5 ± 8.4	
Gingiva	7 (53.8%)		63.0 ± 14.5	
Others	49 (55.1%)		67.1 ± 5.8	
Size of tumor				
T1	20 (90.9%)**	0.001	96.8 ± 7.5†	0.034
T2	33 (62.3%)		73.6 ± 7.3	
T3	28 (45.2%)		54.7 ± 6.9	
T4	47 (49.5%)		61.0 ± 5.7	
Lymph node				
N0	82 (61.2%)	0.092	73.6 ± 4.7†	0.049
N1	22 (48.9%)		59.0 ± 8.3	
N>1	24 (45.3%)		51.7 ± 7.8	
Metastasis				
M0	127 (55.2%)	0.294	65.8 ± 3.7	0.976
M1	0 (0.0%)		50.5 ± 26.5	
Stage				
I	16 (94.1%)***	<0.001	101.2 ± 6.5††	0.005
II	26 (61.9%)		74.8 ± 8.0	
III	32 (52.5%)		62.8 ± 7.0	
IV	55 (44.7%)		54.6 ± 5.0	
Treatment				
Surgery	48 (70.6%)**	0.002	81.8 ± 6.4††	0.005
Surgery + RT	53 (67.9%)**		80.9 ± 6.0††	
RT	38 (52.8%)		66.0 ± 6.2	
RT + CT	18 (43.9%)		39.3 ± 5.7	
CT	3 (18.8%)		28.9 ± 10.6	
Surgery + RT + CT	6 (50.0%)		29.8 ± 6.8	
Surgery + CT	2 (50.0%)		48.0 ± 16.1	
No treatment	87 (54.0%)		64.6 ± 4.5	

* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$, Chi-square,
† $P < 0.05$.
†† $P < 0.01$.††† $P < 0.001$, long rank Mantel–Cox test (mean ± standard error). CT = chemotherapy, NI = not informed (all caselas survival censored form), RT = radiotherapy, SCC = squamous cell carcinoma.

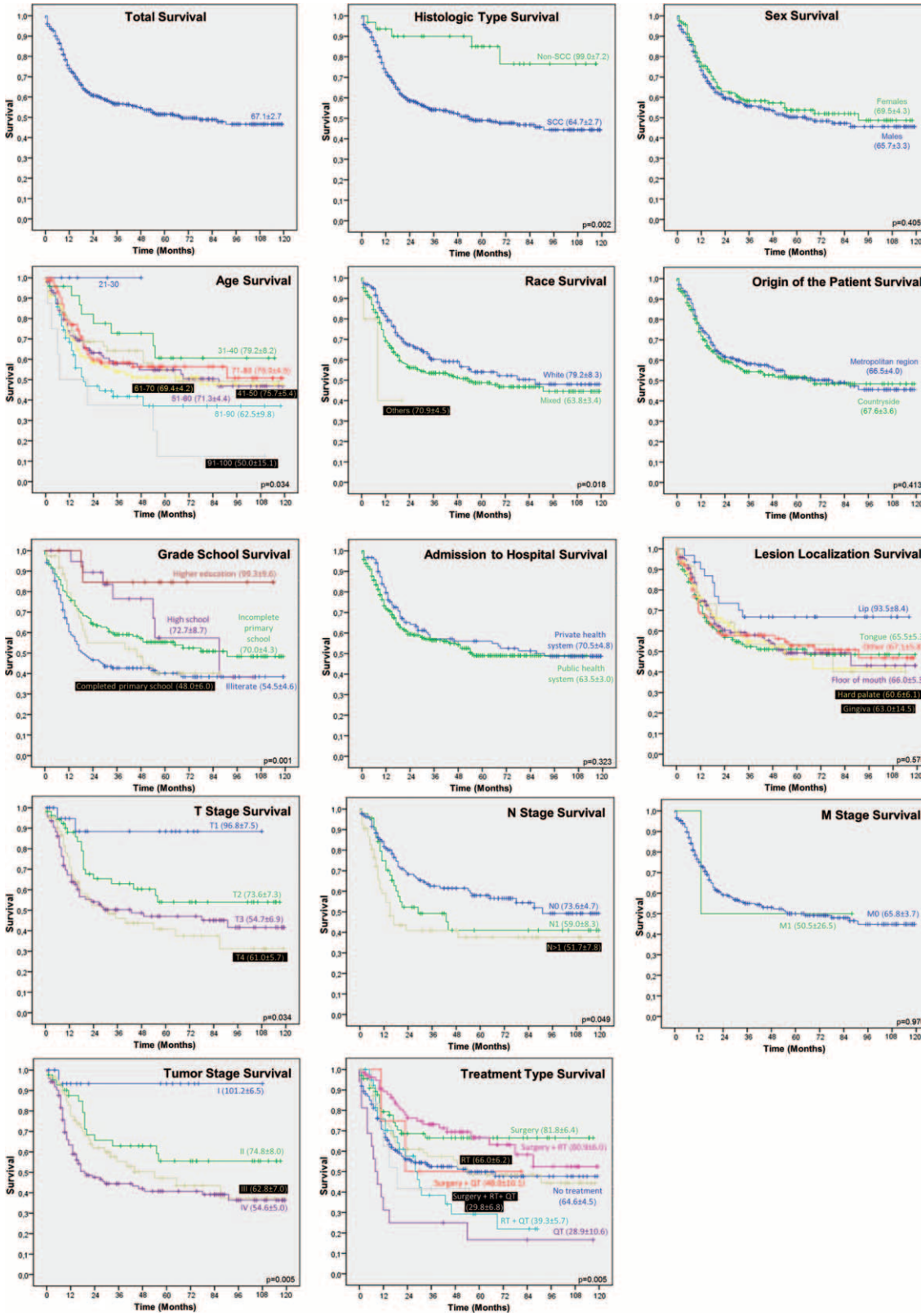

FIGURE 1. Ten-year survival of patients diagnosed with oral cancer in Haroldo Juaçaba Hospital (2000–2009) (long-rank Mantel–Cox).

TABLE 3. Influence of Histological Type of Oral Cancer in the Clinical, Demographic, Socioeconomic, and Therapeutic Profile of Patients Treated at the Haroldo Juaçaba Hospital (Cancer Institute of Ceará)

Histologic type	SCC	Non-SCC	*P*-Value
Sex			
Males	349 (66.6%)***	17 (34.7%)	<0.001
Females	175 (33.4%)	32 (65.3%)***	
Age			
21–30	2 (0.4%)	6 (12.2%)***	<0.001
31–40	19 (3.6%)	10 (20.4%)***	
41–50	70 (13.4%)***	7 (14.3%)	
51–60	119 (22.7%)***	5 (10.2%)	
61–70	130 (24.8%)***	14 (28.6%)	
71–80	110 (21.0%)***	3 (6.1%)	
81–90	63 (12.0%)	4 (8.2%)	
91–100	11 (2.1%)	0 (0.0%)	
Race			
Mixed	318 (60.7%)	29 (59.2%)	0.795
White	187 (35.7%)	19 (38.8%)	
Others	19 (3.6%)	1 (2.0%)	
Origin			
Metropolitan region	269 (51.3%)	28 (57.1%)	0.452
Countryside	253 (48.7%)	21 (42.9%)	
Education level			
Illiterate	162 (38.8%)**	7 (18.4%)	0.007
Incomplete primary school	170 (40.8%)	18 (47.4%)	
Completed primary school	45 (10.8%)	3 (7.9%)	
High school	28 (6.7%)	6 (15.8%)**	
Higher education	12 (2.9%)	4 (10.5%)**	
Covenant			
Public health system	373 (71.2%)	29 (59.2%)	0.079
Private health system	151 (28.8%)	20 (40.8%)	
Location			
Floor of mouth	150 (28.6%)***	3 (6.1%)	<0.001
Tongue	141 (26.9%)***	4 (8.2%)	
Hard plate	80 (15.3%)	25 (51.0%)***	
Lip	38 (7.3%)***	2 (4.1%)	
Gingiva	16 (3.1%)	0 (0.0%)	
Others	99 (18.9%)	15 (30.6%)***	
Size of tumor			
T1	19 (7.2%)	5 (33.3%)***	<0.001
T2	57 (21.6%)	8 (53.3%)***	
T3	75 (28.4%)***	1 (6.7%)	
T4	113 (42.8%)***	1 (6.7%)	
Lymph node			
N0	153 (58.0%)	14 (93.3%)*	0.022
N1	48 (18.2%)	1 (6.7%)	
N>1	63 (23.8%)*	0 (0.0%)	
Metastasis			
M0	262 (99.3%)	15 (100.0%)	1.000
M1	2 (0.7%)	0 (0.0%)	
Stage			
I	14 (5.4%)	5 (31.3%)***	<0.001
II	45 (17.5%)	8 (50.0%)***	
III	73 (28.4%)***	2 (12.5%)	
IV	125 (48.7%)***	1 (6.2%)	
Treatment			
Surgery	91 (17.4%)	16 (32.7%)*	0.025
Surgery + RT	104 (19.8%)*	6 (12.2%)	
RT	74 (14.1%)	7 (14.3%)	
RT + CT	43 (8.2%)	3 (6.1%)	
CT	15 (2.9%)	2 (4.1%)	
Surgery + RT + CT	16 (3.1%)	0 (0.0%)	
Surgery + CT	3 (0.6%)	2 (4.1%)	
No treatment	178 (34.0%)*	13 (26.5%)	

* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$, Chi-square. CT = chemotherapy, RT = radiotherapy, SCC = squamous cell carcinoma.

TABLE 4. Influence of Education in the Clinical, Demographic, Socioeconomic, and Therapeutic Profile of Patients Treated at Haroldo Juaçaba Hospital (Cancer Institute of Ceará) (2000–2009)

Education Level	Illiterate	Incomplete Primary School	Completed Primary School	High School	Higher Education	*P*-Value
Sex						
Males	87 (51.5%)	136 (72.3%)*	28 (58.3%)	24 (75.0%)*	12 (75.0%)*	0.001
Females	82 (48.5%)*	52 (27.7%)	20 (41.7%)*	10 (29.4%)	4 (25.0%)	
Age						
21–30	1 (0.6%)	0 (0.0%)	0 (0.0%)	2 (5.9%)	1 (6.3%)	<0.001
31–40	1 (0.6%)	10 (5.3%)	3 (6.3%)	5 (14.7%)	5 (31.3%)*	
41–50	10 (5.9%)	30 (16.0%)	7 (14.6%)	11 (32.4%)*	3 (18.8%)	
51–60	27 (16.0%)	45 (23.9%)*	14 (29.2%)*	8 (23.5%)	1 (6.3%)	
61–70	55 (32.5%)*	43 (22.9%)	9 (18.8%)	4 (11.8%)	3 (18.8%)	
71–80	34 (20.1%)*	42 (22.3%)	11 (22.9%)	4 (11.8%)	2 (12.5%)	
81–90	34 (20.1%)*	17 (9.0%)	3 (6.3%)	0 (0.0%)	1 (6.3%)	
91–100	7 (4.1%)	1 (0.5%)	1 (2.1%)	0 (0.0%)	0 (0.0%)	
Race						
Mixed	123 (72.8%)*	113 (60.1%)	28 (58.3%)	14 (41.2%)	7 (43.8%)	0.006
White	42 (24.9%)	71 (37.8%)	17 (35.4%)	20 (58.8%)*	9 (56.2%)*	
Others	4 (2.3%)	4 (2.1%)	3 (6.3%)	0 (0.0%)	0 (0.0%)	
Origin						
Metropolitan region	62 (36.9%)	97 (51.6%)	31 (64.6%)	31 (91.2%)*	13 (81.3%)*	0.014
Countryside	106 (63.1%)*	91 (48.4%)	17 (35.4%)	3 (8.8%)	3 (18.8%)	
Covenant						
Private health system	38 (22.5%)	51 (27.1%)	17 (35.4%)	18 (52.9%)*	9 (56.3%)*	<0.001
Public health system	131 (77.5%)*	137 (72.9%)*	31 (64.6%)	16 (47.1%)	7 (43.8%)	
Location						
Lip	9 (5.3%)	17 (9.0%)	5 (10.4%)	0 (0.0%)	1 (6.3%)	0.204
Tongue	43 (25.4%)	44 (23.4%)	13 (27.1%)	14 (41.2%)	5 (31.3%)	
Gingiva	6 (3.6%)	3 (1.6%)	3 (6.3%)	0 (0.0%)	1 (6.3%)	
Floor of mouth	39 (23.1%)	53 (28.2%)	10 (20.8%)	10 (29.4%)	2 (12.5%)	
Hard plate	35 (20.7%)	32 (17.0%)	4 (8.3%)	7 (20.6%)	5 (31.3%)	
Others	37 (21.9%)	39 (20.7%)	13 (27.1%)	3 (8.8%)	2 (12.5%)	
Size of tumor						
T1	4 (5.1%)	7 (7.5%)	1 (4.2%)	1 (5.6%)	2 (33.3%)	0.011
T2	11 (13.9%)	21 (22.6%)	7 (29.2%)	7 (38.9%)	4 (66.7%)*	
T3	20 (25.3%)	29 (31.2%)	6 (25.0%)	4 (22.2%)	0 (0.0%)	
T4	44 (55.7%)*	36 (38.7%)*	10 (41.6%)*	6 (33.3%)	0 (0.0%)	
Lymph node						
N0	48 (60.8%)	56 (60.2%)	14 (58.3%)	11 (61.1%)	4 (66.7%)	0.647
N1	10 (12.7%)	14 (15.1%)	6 (25.0%)	4 (22.2%)	2 (33.3%)	
N>1	21 (26.5%)	23 (24.7%)	4 (16.7%)	3 (16.7%)	0 (0.0%)	
Metastasis						
M0	78 (98.7%)	93 (100.0%)	23 (95.8%)	18 (100.0%)	6 (100.0%)	0.404
M1	1 (1.3%)	0 (0.0%)	1 (4.2%)	0 (0.0%	0 (0.0%)	
Stage						
I	4 (4.6%)	3 (3.2%)	1 (3.7%)	1 (5.3%)	2 (28.6%)	0.032
II	11 (12.6%)	16 (17.0%)	7 (25.9%)	7 (36.8%)	2 (28.6%)	
III	17 (19.5%)	28 (29.8%)	6 (22.2%)	4 (21.1%)	2 (28.6%)	
IV	55 (63.2%)*	47 (50.0%)*	13 (48.1%)*	7 (36.8%)*	1 (14.2%)	
Treatment						
Surgery	24 (14.2%)	29 (15.4%)	12 (25.0%)*	5 (14.7%)	3 (18.8%)	0.013
Surgery + RT	28 (16.6%)	41 (21.8%)	11 (22.9%)	10 (29.4%)*	2 (12.5%)	
RT	17 (10.1%)	28 (14.9%)	7 (14.6%)	8 (23.5%)	6 (37.5%)*	
RT + CT	10 (5.9%)	15 (8.0%)	3 (6.3%)	3 (8.8%)	1 (6.2%)	
CT	4 (2.4%)	8 (4.3%)	3 (6.3%)	1 (3.0%)	0 (0.0%)	
Surgery + RT + CT	3 (1.8%)	5 (2.7%)	1 (2.0%)	3 (8.8%)	1 (6.2%)	
Surgery + CT	1 (0.6%)	2 (1.1%)	0 (0.0%)	1 (3.0%)	0 (0.0%)	
No treatment	82 (48.4%)*	60 (32.8%)*	11 (22.9%)	3 (8.8%)	3 (18.8%)	

* $P < 0.05$.Chi-square. CT = chemotherapy, RT = radiotherapy.

TABLE 5. Influence of the Stage of Oral Cancer in Patients Diagnosed at Haroldo Juaçaba Hospital (Cancer Institute of Ceará) (2000–2009)

Stage	I	II	III	IV	*P*-Value
Sex					
Males	6 (31.6%)	39 (73.6%)*	45 (60.0%)*	99 (66.4%)*	0.009
Females	13 (68.4%)*	14 (26.4%)	30 (40.0%)	50 (33.6%)	
Age					
21–30	3 (15.8%)*	2 (3.8%)	0 (0.0%)	0 (0.0%)	0.002
31–40	1 (5.3%)	3 (5.7%)	2 (2.7%)	5 (3.3%)	
41–50	5 (26.3%)*	6 (11.3%)	12 (16.0%)	24 (16.1%)	
51–60	6 (31.5%)	11 (20.7%)	12 (16.0%)	35 (23.5%)	
61–70	3 (15.8%)	17 (32.1%)*	16 (21.3%)	37 (24.8%)	
71–80	1 (5.3%)	8 (15.1%)	22 (29.3%)*	29 (19.5%)	
81–90	0 (0.0%)	4 (7.5%)	10 (13.3%)*	16 (10.7%)*	
91–100	0 (0.0%)	2 (3.8%)	1 (1.4%)	3 (2.1%)	
Race					
Mixed	12 (63.2%)*	33 (62.3%)*	36 (48.0%)	98 (55.0%)*	0.009
White	5 (26.3%)	18 (34.0%)	36 (48.0%)*	47 (31.5%)	
Others	2 (10.5%)	2 (3.7%)	3 (4.0%)	0 (13.5%)	
Origin					
Metropolitan region	11 (57.9%)	27 (50.9%)	45 (60.8%)	80 (53.7%)	0.692
Countryside	8 (42.1%)	26 (49.1%)	29 (39.2%)	68 (45.6%)	
Covenant					
Private health system	5 (26.3%)	22 (41.5%)	28 (37.3%)	42 (28.2%)	0.170
Public health system	14 (73.7%)	31 (58.5%)	47 (62.7%)	107 (71.8%)	
Treatment					
Surgery	8 (15.8%)	16 (28.3%)	8 (44.0%)*	11 (15.4%)	<0.001
Surgery + RT	3 (0.0%)	15 (0.0%)	33 (2.7%)	23 (6.0%)	
RT	5 (26.3%)	14 (36.4%)*	12 (16.0%)	22 (14.8%)	
RT + CT	0 (0.0%)	1 (1.9%)	2 (0.0%)	33 (1.3%)	
CT	0 (0.0%)	0 (1.9%)	2 (2.7%)	9 (22.1%)*	
Surgery + RT + CT	0 (15.8%)	1 (9.4%)	3 (20.0%)*	5 (29.6%)*	
Surgery + CT	0 (0.0%)	1 (1.9%)	0 (4.0%)	2 (3.4%)	
No treatment	3 (42.1%)*	5 (30.2%)*	15 (10.6%)	44 (7.4%)	

* $P < 0.05$.Chi-square. CT = chemotherapy, RT = radiotherapy.

(n = 14, 36.4%) and abstention from therapy (n = 5, 30.2%) for stage II, surgery alone (n = 8, 44.0%) for stage III, and chemotherapy alone for stage IV tumors (n = 9, 22.1%) ($P < 0.001$) (Table 5).

DISCUSSION

Oral cancer is a disease strongly influenced by social factors.[14,15] In this sample, the majority of patients were male. This is in accordance with the epidemiological profile of our population where most men are smokers.[16,17]

In the present study, oral cancer was more common in individuals with 61 to 70 years of age. Ayaz et al[18] in Pakistan noted an increasing involvement of oral malignant lesions in patients less than 40 years of age, diverging from our data. Despite this contradiction, Wunsch-Filho[16] reported that cigarette smoking is a principle risk factor for oral cancer and combined with an increase in age magnifies the development of these lesions.

The primary locations of the tumors with the highest prevalence were the floor of the mouth and tongue. Chen et al[11] and Bhurgri et al[19] (Pakistan and Taiwan, respectively) discovered that the floor of the mouth is the most common site of cancer involvement and is associated with the habit of chewing tobacco and betel. Gellrich et al[20] (Europe) also found that the floor of the mouth was a prevalent site of cancer development, but this site was not related to the habit of chewing. Other epidemiological studies showed that the tongue is the most affected site.[21–23]

In the present study, the racial distribution of the sample showed a higher prevalence of lesions in patients of mixed race. This increased incidence was related to the large number of people in our country who are considered multiracial.[25] Gervásio et al[24] stated that significant mixing of the population has made it difficult to perform race analyses, as multiracial people are considered the majority.

Regarding education, the majority of the patients had an incomplete primary school or was illiterate. Oral cancer is related to a low education level, which may be due in part to a reduced access to information about the disease in general, including the diagnosis and treatment.[8,16,26] Due to the economic status of these patients, many were admitted to the hospital through the public health system.[22]

Studies in developing countries have found that oral cancer is diagnosed at advanced stages, unlike in developed countries in which the most prevalent stages are I and II.[12,27–30,31,32] This situation revealed a strong influence of socioeconomic factors on the delayed diagnosis.

The SCC was the main histological type detected in the present study, weighing in strongly in survival rate of 10 years, observed in 56.5%.[19,22,27,33] Few studies have investigated long periods of survival and the majority of these have been restricted to 5 years. During this evaluation period, survival varies from 30% to 80% and changes according to the study site, socioeconomic, and cultural factors.[13,26,34]

The patient age is a major factor in the survival of oral cancer. In this study, and in another by Razak et al,[12] an inverse association between age and stage of disease was observed. Individuals older than 60 years were associated with stages II, III, and IV, and a worse survival compared to younger patients.

Consistent with a study by Razak et al[12] in which size T1 tumors were associated with a significantly better survival, Iype et al[27] showed that after 5 years, no groups of patients diagnosed with T4 tumors in India remained alive.

In the present study, only patients with stage I disease had good survival rates; women comprised a high percentage of patients in this group because they sought earlier and more health services compared with men, thus affecting the survival rate.[35] Thus, men tended to survive for shorter periods of time, as a result of the delayed diagnosis.[13]

In the current study, illiterate patients showed an increased frequency of therapeutic abstention, revealing a close relationship between a low education level, late diagnosis, and poor prognosis. Despite this data, Wong et al[10] reported that there was no correlation between patient survival and their schooling.

Consequently, associated surgery or omitting RT treatments normally used for tumors diagnosed early were associated with a survival rate significantly higher than the other treatment options. Al-Rawi and Talabani[36] (Iraq) stated that earlier stages lead to less invasive treatments, which are associated with a better prognosis.

Patients with SCC had a worse survival rate compared with those with non-SCC. The SCC patients consisted mostly of men with an advanced age, whereas females with younger age ranges had a higher prevalence of non-SCC. Additionally, patients with SCC were more frequently in illiterate and incomplete primary school groups and in association with disease stages III and IV. These data were in agreement with previous studies showing that cancers such as non-SCC are more prevalent in women. In men SCC is more common and often diagnosed much later, leading to a worse prognosis.[24,36,37]

Thus, the SCC malignancy accounts for more than 90% of the oral cancers analyzed in the present study. Previous studies have demonstrated that the illness process is treated differently in the population with a lower level of education. This has led some authors to consider oral cancer, particularly when speaking of SCC, as a disease that is characteristic of people with a low economic and educational level.[14] Oji and Chukwuneke[29] (Nigeria) concluded that one of the factors closely related to an advanced stage of oral cancer is the lack of education of the population. In Brazil, patients with a lower income and education level had a higher mortality rate due to oral cancer.[10]

Although studies[14,15] showed that oral cancer survival is closely related to social factors, the present study demonstrated that the educational level of the patients influenced the survival significantly. The majority of the studies evaluated 5-year survival, but our results exhibit 10 years of follow-up. In addition, we observed a significantly lower survival rate in patients with SCC compared to patients with malignancies of other histological types.

The incidence of oral cancer in a population of Northeast Brazilians contained a large proportion of SCC and that the survival of the patients was inversely related to their level of education, which could lead to a diagnosis at advanced stages of disease, abstention from treatment, and poor prognosis.

In the present study, the influence of socioeconomic factors on the prognosis of oral cancer suggests that the association between poverty and mortality due to oral cancer requires intervention by public health policies in populations with low social status and income levels to improve life expectancy and quality of life. It is important to emphasize that the Haroldo Juaçaba Hospital serves as a reference treatment center for lower income individuals fighting all types of cancer in the state of Ceará (northeastern Brazil). Large multicenter studies are needed to know the closest oral cancer profile of this population.

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