

Epidemiology of head and neck cancer and survival in Hong Kong between 2006 and 2017

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1. Introduction

Cancer is one of the top non-transmittable diseases in Hong Kong, survival analysis is a powerful tool for assessing patients’ prognosis in cancer patients, especially for Head and Neck Squamous Cell Carcinoma (HNSCC), within the top ten most common cancer worldwide (Belfiore et al., 2024). Whilst nasopharynx and thyroid cancer ranked 6^h and 8^h in 20-year prevalence rate, in which a high prevalence would put a heavier burden to the healthcare system (Hospital Authority, 2024). The incidence and treatment outcomes were influenced by the demographic factors including age, gender. This study analyses a longitudinal dataset from 2006 to 2017, comprise of stage of carcinoma at diagnosis, tumor’s resectability and rate of secondary treatment required. The goal is to identify factors that helps to predict the 1-year and 5-year survival rates in HNSCC patients.

2. Method

2.1 Participants

The study performed at hospitals including Queen Mary Hospital, Queen Elizabeth Hospital, Tuen Mun Hospital and Prince Margaret Hospital, where data were collected from patients with locally advanced non-metastatic head and neck squamous cell carcinoma patients from 2006-2017 and in stage III, IVa and IVb. Yet, patients with history of cancer of salivary gland, nasopharynx, paranasal sinus, nasal cavity and thyroid will be automatically excluded from the study as to reduce the error affected by the recurrence or metastasis of previous carcinoma, as recurrence or second primary tumor influences the patient’s prognosis by their and their tumor’s characteristics and previous treatment modalities.

2.2 Statistical Analysis

Descriptive analysis was performed for the entire sample as well as divided into stratas according to their age groups and gender respectively. Number and corresponding percentages were presented for categorical variables, Chi-square test was used for comparison accordingly. Mean and standard deviations were presented for continuous variables, and student’s t-test were used in comparison. Due to limitation in the data collected, Kaplan-Meier survival curves and Cox proportion hazard models will not be performed. Linear regression and ANOVA was used to see how much the variable affects survival rate. A two tailed $p < 0.05$ was considered statistically significant in this study and all analyses were conducted using SPSS version 30.0 (IBM Corp., Armani, NY, USA).

3. Results

Total ofatients (80.72%) reported and 322 (19.28%) are female patients. By age group, 37 patients (2.22%) in group 1 (< 40 years), 131 patients (7.84%) in group 2 (40 to 49 years old), 454 patients (27.19%) are in group 3 (50 to 59 years old) and group 4 (60 to 69 years old) respectively, 382 (22.87%) patients are in group 5 (70 to 79 years old) and 212 patients (12.69%) are in group 6.

There is significant difference between resectability of tumor and 5-year survival rate between male and female. In several studies (Kurita et al., 2003, Santos et al., 2021; Yousem et al., 2006) survival rates for patients who received surgical intervention had a significantly higher survival rate in 1-, 2- and 5-years than those who received non-surgical intervention.

1670 patients was recruited, Predominantly male pMale patients were found to have a lower resectability in HNSCC than women 2.07 odds ratio (OR). By linear regression and multivariate analysis of variance (Fig. 2 & Fig. 3), the stage of tumor (Stage III, IVa, IVb) had found to have a strong negative correlation with survival rate, the more advanced the staging, the lower the survival rate in 1- year and 5-year. In addition, gender was found to have a significant impact over the 5-year survival rate across the sample, where male (Mean = 38.71%, 95% CI = 35.93%, 41.49%) had a significantly lower 5-year survival rate than that of female (Mean = 52.05%, 95 % CI = 44.31%, 59.79%). It may suggest that stage of tumor at diagnosis and gender would be an important prognosis factor in prediction of survival rate of the HNSCC patients. For other factors collected, non-significant correlation was found with each other, including the resectability, stage of tumor and the need for secondary treatment.

4. Discussion

The analysis for the retrospective cohort study for Head and Neck Squamous Cell Carcinoma (HNSCC) patients in Hong Kong aimed to identify factors influencing 1-year and 5-year survival rates, including demographic variables (age, gender), tumor stage at diagnosis, resectability, and the need for secondary treatment. The results from the linear regression and multivariate ANOVA (MANOVA) analyses provided valuable insights, revealing significant association between tumor stage and survival rates, as well as gender difference in 5-year survival. However, the study found no sufficient evidence to establish significant correlations between several factors such as age, resectability, and the need for secondary treatment and survival outcomes. These findings, informative, must be interpreted in the context of the study’s limitation and compared with existing literature to join meaningful conclusion.

The significant negative correlation between tumor stage and survival rates, as demonstrated by linear regression ($R^2 = 0.496$ for 1-year, 0.723 for 5-year, $p < 0.001$) and MANOVA ($F = 16.267$ for 1-year, $F = 43.075$ for 5-year, $p < 0.001$), aligns with established clinical knowledge. The more advanced the stage (III, Iva, IVb), the lower the 1-year and 5 year survival rates, with Stage IVb patients likely facing the greatest challenges due to tumor burden and metastatic potential (Belford et al., 024). The stronger effect on 5-year survival ($R^2 = 0.723$) suggests that stage-related differences become more pronounced over time, possibly due to cumulative treatment challenges or disease progression in advanced stage.

The lack of significant correlations between some factors (e.g., age, resectability, secondary treatments needs) and survival rate does not necessarily imply that no relationships exist. Instead, it reflects the limitations of the current study, particularly the reliance on aggregated data rather than individual-level records. The sample size within specific strata (e.g., by year, stage, or sez) may have been insufficient to detect significant differences, a common issue in studies with limited granularity that can lead to type II errors (Kleinbaum & Klein, 2012). This limitation contrast with other studies that report stronger associations, possibly due to the large sample size or individual analysis (Fermat et a., 2015).

Tumor resectability vs Gender		
	Male	Female
Resectable	553	190
Non-resectable	795	132
Odds	553 / 795 = 0.6956	190 / 132= 1.4394
Odd ratio = Odds	1.4394 / 0.6956 = 2.0693	
Female / Odds Male		

Figure 1. Odd ratio of Gender to Tumor’s resectability

Linear Regression Stage of tumor at diagnosis towards 1- year & 5-year survival rate				
Surviva	R	R	Adjusted R	Standard Error of
l Rate		Square	square	the Estimate
1-year	0.705*	0.496*	0.482*	0.1012
5-year	0.850*	0.723*	0.715*	0.0927

Figure 2. Linear Regression on stage of tumor at diagnosis towards 1- and 5-year survival rate, $p < 0.001$ *

Multivariate Test (MANOVA) on Stage of Tumor towards 1-year and 5-year survival rate				
Survival	F-ratio	R	R	Adjusted R
rate			squared	Square
1-year	16.267	0.344	0.496*	0.466*
	*	*		
5-year	43.075	0.762	0.723*	0.706*
	*	*		

Figure 3. MANOVA on Stage of tumor at diagnosis towards 1- and 5-year survival rate, $p < 0.001$ *

Mean 5-year survival rate between female and male				
	Mean	N	Standard Deviation	Standard Error of Mean
Male	0.3871	1348	0.0491	0.0142
Female	0.5205	322	0.1367	0.0395
Mean difference (By year)	-0.1334	12	0.1350	0.0390
Weighted mean difference	-0.0735	1670	0.1615	0.0040

Figure 4: Mean 5-year survival rate between female and male, $p < 0.006$ *, $p < 0.0001$ **

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