



University of California
San Francisco

Impact of socioeconomic status on presentation among urban patients undergoing total thyroidectomy

Tara J. Wu, BA¹; Patrick K. Ha, MD²; Ivan H. El-Sayed, MD²; Jonathan R. George, MD, MPH²; Chase M. Heaton, MD²; William R. Ryan, MD²; Marika D. Russell, MD²

¹School of Medicine, University of California-San Francisco

²Division of Head and Neck Oncologic and Endocrine Surgery, Department of Otolaryngology-Head and Neck Surgery, University of California-San Francisco, San Francisco

ABSTRACT

Objectives: To examine the impact of socioeconomic status on the presentation of thyroid disease in urban patients undergoing total thyroidectomy.

Study Design: Retrospective review.

Methods: We examined the records of 252 patients undergoing total thyroidectomy at an urban safety-net hospital and two tertiary care hospitals, from January 2012 to May 2016. Demographic variables included age, sex, race, health insurance type (as a measure of socioeconomic status), and body mass index. Clinical variables included symptoms, comorbidities, pathologic whole thyroid volume (ml) [sum of the left and right lobe volumes], histopathologic features, and TNM staging. Univariate analyses determined the association of low versus high socioeconomic status with clinicopathologic outcomes. Multivariate regression models investigated the association between socioeconomic status and thyroid volume.

Results: On univariate analyses, low socioeconomic status was significantly associated with race ($p < 0.001$), facility ($p < 0.001$), and pathologic thyroid volume ($p = 0.016$). Among patients with malignant disease, low socioeconomic status was associated with positive margins ($p = 0.008$), a greater number of positive nodes ($p = 0.002$), and larger metastatic deposit size ($p = 0.023$), despite no significant differences in tumor type or TNM staging. After multivariate regression analyses, among patients with benign disease, low socioeconomic status was the most significant independent predictor of larger volume ($p = 0.002$), after adjustment for age, sex, body mass index, and compressive symptoms.

Conclusions: Patients of low socioeconomic status suffered greater disease burden at time of thyroidectomy, including larger gland volumes, advanced nodal disease, and positive margins. Targeted outreach in communities of low socioeconomic status may improve health literacy for timely access to care.

CONTACT

Tara Wu, BA
University of California-San Francisco
1001 Potrero Avenue, SFGH 5, Rm 3A30, UCSF Box 0870, San Francisco, CA 94110
Email: Tara.Wu@ucsf.edu

INTRODUCTION

Socioeconomic status (SES) is a powerful determinant of health that influences presentation and outcome of disease. Identifying and addressing health disparities in head and neck conditions has become of clear importance.

Prior studies have examined socioeconomic disparities in the presentation of thyroid malignancy. Low SES has been associated with larger tumor size, advanced stages, presence of metastatic disease, aggressive pathologic features, lower cancer-specific survival outcomes even after adjusting for tumor stage, and decreased likelihood of receiving radioactive iodine treatment after thyroidectomy. Few studies have examined the association of SES with whole thyroid volume as a measure of benign disease burden. In one prior study, Medicare-insured patients were both more likely to have substernal versus nonsubsternal goiters, and more likely to experience postoperative complications, compared to privately insured patients. However, goiter volume was not examined as a continuous outcome variable, limiting the conclusions that can be drawn. Another study found patients with low levels of education to present with larger volumes. However, this study did not account for body mass index (BMI) or comorbidities. Additionally, thyroid ultrasonography (US) alone was used to measure volume, which may have inadequately captured patients with large goiters, where US would be limited in capturing complete thyroid dimensions.

With the present study, we aimed to examine the influence of SES on benign and malignant thyroid disease. We concurrently evaluated demographic and clinical variables known to influence the presentation of thyroid disease. This is the first study to examine the association between SES and whole thyroid volume, utilizing pathologic volumes as a measure of disease burden, in a multivariate analysis to better evaluate their association.

METHODS AND MATERIALS

A retrospective review was conducted of patients undergoing total thyroidectomy from January 2012 to May 2016 at three urban teaching hospitals: ZSFG, a public hospital providing care to San Francisco's underserved community, and UCSF, a tertiary care referral center with two major campuses. Exclusion criteria included surgeries performed for non-thyroid disease and non well-differentiated thyroid carcinomas. EMRs were reviewed to obtain demographic characteristics, including age, sex, race/ethnicity, health insurance type, and BMI. Clinical variables included history of prior head and neck radiation, presence of concomitant Graves' disease or Hashimoto's thyroiditis, comorbidities, presence of compressive symptoms, pathologic whole thyroid volume, diagnosis, histopathologic features, and TNM staging.

SES was stratified into 2 levels based on health insurance type: low SES (poor/uninsured) versus high SES (private/government/military). Poor/uninsured included Medi-Cal, county-funded insurance, or uninsured. Private/government/military included managed care/HMO/PPO, Medicare, TRICARE, VA, or Federal Employee Program. Comorbidities were scored by the Charlson Comorbidity Index Score. Pathologic whole thyroid volumes (ml) were calculated by summing the left and right lobe volumes, excluding the isthmus. The volume of each lobe was calculated as the anteroposterior dimension (cm) x mediolateral dimension (cm) x craniocaudal dimension (cm) x correction factor ($\pi/6$).

Pathologic diagnoses were grouped into benign disease (adenoma, benign nodule, multinodular goiter, Hashimoto's thyroiditis, or Graves' disease) or malignant disease (papillary thyroid carcinoma, follicular carcinoma, or Hurthle cell carcinoma). Histopathologic variables collected for malignant disease included margin status, presence of extrathyroidal extension or lymphovascular invasion, number of positive nodes, and largest metastatic deposit size (cm).

Statistical analysis was performed using Stata13. Univariate analyses were performed to assess differences in clinical variables between low and high SES cohorts. In these analyses, students' t-tests were performed for normally distributed continuous variables, Wilcoxon-Mann-Whitney tests for non-normally distributed continuous variables, and Fisher's exact tests for categorical variables. P-values were calculated with a significance level set as $\alpha = 0.05$. In further univariate analyses, clinical variables were tested for an association with thyroid volume using Wilcoxon-Mann-Whitney tests for dichotomous variables and Kruskal-Wallis tests for categorical variables. Independent variables with statistically significant association (p -value < 0.05) with thyroid volume were considered potential confounders and included in multivariable linear regression models.

RESULTS

Our study population consisted of a total of 252 patients, with 61 patients from ZSFG and 191 patients from UCSF. Based on insurance status, 120 (47.62%) patients were considered low SES, and 132 (52.38%) patients were considered high SES. Median whole thyroid volume measured by pathologic specimen was 30.75ml (range 2.48 – 855.17ml). 192 (76.19%) patients had malignant disease, while 60 (23.81%) patients had benign disease.

Comparing low versus high SES cohorts, there were significant differences in race ($p < 0.001$), facility receiving treatment ($p < 0.001$), and thyroid gland volume ($p = 0.016$) (Table 1), but no significant differences in age, sex, BMI, Charlson Comorbidity Index Score, history of prior radiation, concomitant thyroid disease, presence of compressive symptoms, or diagnosis of benign versus malignant disease. Among patients with malignant disease, low SES was significantly associated with positive margins ($p = 0.008$), a greater number of positive nodes ($p = 0.002$), and larger size of metastatic deposit ($p = 0.023$), despite no significant differences in tumor type or TNM staging (Table 1).

Demographic and Clinical Characteristics	Low SES n=120	High SES n=132	p-value
	Mean (\pm SD), Median (Range), or n (%)	Mean (\pm SD), Median (Range), or n (%)	
Race/Ethnicity			<0.001
Non-Hispanic White	33 (27.50%)	84 (63.64%)	
Hispanic	31 (25.83%)	11 (8.33%)	
Non-Hispanic Black	8 (6.67%)	6 (4.55%)	
Asian/Pacific Islander	45 (37.50%)	23 (17.42%)	
Other/Declined	3 (2.50%)	8 (6.06%)	
Facility			<0.001
Zuckerberg San Francisco General (ZSFG)	61 (50.83%)	0 (0.00%)	
University of California, San Francisco (UCSF)	59 (49.17%)	132 (100.00%)	
Pathologic Thyroid Volume (median and range, ml)	34.58 (3.65, 855.17)	27.26 (2.48, 347.85)	0.016
Margin Status			0.008
Negative	14 (11.22%)	23 (17.42%)	
Close	43 (35.83%)	58 (43.96%)	
Positive	35 (28.96%)	18 (13.62%)	
Total Number of Positive Nodes (median and range)	6 (0, 37)	1.5 (0, 36)	0.002
Largest Metastatic Deposit (median and range, cm)	2 (<0.1, 6.2)	1 (0.1, 6.5)	0.023

Table 1. Sample of demographic and clinical characteristics of patients undergoing total thyroidectomy, stratified by socioeconomic status (only statistically significant variables are listed in the table).

Stratified multivariate linear regression analyses of thyroid volume and SES were performed for benign ($n = 60$) and malignant ($n = 192$) disease separately. For benign disease, after adjusting for age, race, BMI, and presence of compressive symptoms, low SES ($p = 0.002$) was the most significant variable associated with larger thyroid volume. Older age ($p = 0.034$) was less significantly associated. For malignant disease, after adjusting for age, race, BMI, and presence of compressive symptoms, larger thyroid volume was not significantly associated with low SES ($p = 0.274$). Instead, older age ($p < 0.001$) and higher BMI ($p = 0.020$) were significantly associated with thyroid volume.

DISCUSSION

Advanced presentation of disease is a powerful predictor of poor surgical outcomes. Our study elucidated a significant association between low SES and higher burden of disease at presentation for thyroid surgery, as measured by larger thyroid volumes among patients with benign disease and positive margins and advanced nodal disease among patients with malignant disease. Larger thyroid volumes at initial presentation in patients of low SES have significant clinical implications. The consequences include increased likelihood of compressive symptoms, tracheal deviation, increased risk for thyroid malignancy, and failure to detect malignant disease ("white noise effect"). Other sequelae include more difficult surgery, including need for median sternotomy, increased risk of recurrent laryngeal nerve palsy, and poorer post-operative outcomes. A notable limitation of our study is that SES is a multifactorial variable, including insurance, income, education level, and occupation. As such, using insurance status alone as a surrogate for SES may not adequately capture this variable. However, given the lack of studies examining SES and benign thyroid disease and the robust nature of our multivariate analyses, our study adds valuable information to the existing literature while corroborating findings already present in the literature.

CONCLUSIONS

Socioeconomic status shapes health behaviors, comorbidities, and exposure to environmental and stressful living conditions. Disparities in initial presentation of disease are often fueled by poor health conditions and inequalities that exist in access to health care. Our study found that low SES patients suffered increased disease burden at time of thyroidectomy, including larger volumes among patients with benign disease, and advanced nodal involvement and positive margins among patients with malignant disease. It is important to address the disparities in presentation of thyroid disease, as advanced presentations are a powerful predictor for poorer outcomes. Ongoing efforts are needed to target screening programs and improve health literacy among low SES communities.

*Please see handout for references.