



Research Paper

An assessment of racial differences in epidemiological, clinical and psychosocial factors among head and neck cancer patients at the time of surgery



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KEYWORDS

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Abstract *Objective:* Racial disparities have been well characterized and African American (AA) patients have 30% lower 5-year survival rates than European Americans (EAs) for head and neck squamous carcinoma (HNSCC). This poorer survival can be attributed to a myriad of different factors. The purpose of this study was to characterize AA-EA similarities and differences in sociodemographic, lifestyle, clinical, and psychosocial characteristics in HNSCC patients near the time of surgery.

Methods: Setting: Single tertiary care center. Participants: Thirty-nine newly diagnosed,

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untreated HNSCC patients ($n = 24$ EAs, $n = 15$ AAs) who were to undergo surgery were recruited. Study Design: Cross-sectional study Sociodemographic, lifestyle factors, and disease factors (cancer site, AJCC clinical and pathologic stage, and HPV status) were assessed. Risk factors, leisure time, quality of life and social support were also assessed using validated questionnaires. Exposures: EA and AA patients were similar in the majority of sociodemographic factors assessed. AAs had a higher trend toward pathologically later stage disease compared to EAs and significantly increased time to treatment.

Results: EA and AA patients were similar in the majority of sociodemographic factors assessed. AAs had a higher trend toward pathologically later stage disease compared to EAs. AAs also had significantly increased time to treatment ($P = 0.05$). The majority of AA patients (62%) had later stage pathologic disease. AA were less likely to complete high school or college ($P = 0.01$) than their EA counterparts. Additionally, AAs were more likely to report having a gap in health insurance during the past decade (37% vs. 15%).

Conclusions: This preliminary study demonstrates a similar profile of demographics, clinical and psychosocial characteristics preoperatively for AAs and EAs. Key differences were AAs tending to have later pathologic stage disease, educational status, delays in treatment initiation, and gaps in health insurance.

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Introduction

Head and neck squamous carcinoma (HNSCC) refers to a diverse suite of malignancies that will cause an estimated 10030 deaths in the US in 2018.¹ Pronounced racial disparities exist in survival of head and neck cancers.² The 5-year relative survival is 30% lower in African Americans (AAs) compared with European Americans (EAs).³ Treatment of HNSCC depends on anatomic site and extent of disease, but can include surgery, chemotherapy, and radiotherapy, and there is ongoing work on immunotherapy.^{4,5} With the ongoing epidemic of HPV-related HNSCC, optimal therapies have become even more debated.^{6–9} While the growing population of head and neck cancer patients are more likely to be nonsmokers, nondrinkers and HPV-positive, a large number of patients, particularly AA patients and those of lower socioeconomic status generally do not meet this picture.^{10,11}

Several studies have investigated the underlying factors that contribute to racial disparities in HNSCC. First, in the SEER database, AAs were 76% more likely than EAs to be diagnosed with distant metastases.¹² For HNSCC patients who are surgical candidates, several studies have observed that AAs are significantly less likely than EAs to undergo surgery, even among populations with similar health insurance status.^{12–14} Another possible reason for disparities is that AAs have biologically more aggressive disease than EAs. AAs are significantly more likely than EAs to be diagnosed with HPV-negative disease and have much poorer survival as a consequence.¹¹ Additionally, AAs have been observed to have a heavier burden of comorbid conditions compared with EAs, which has been observed to contribute to higher mortality for late stage HNSCC patients.¹⁵

Thus, there are clear lines of evidence characterizing clinical factors associated with the racial disparity in HNSCC survival. The racial disparity in HNSCC survival persists even after adjusting for stage, performance status and other

clinical risk indicators, indicating that there are likely other factors contributing to this racial disparity.¹⁶ This is in keeping with understanding that health disparities are multifactorial and complex. Approaches that integrate sociodemographic, lifestyle, clinical, and psychosocial factors hold promise for achieving deeper understanding of the racial disparity in HNSCC survival.^{17–19} Only by understanding the underlying reasons for this disparity can optimal strategies be developed to close the survival gap.

The present study was carried out as a small-scale step in this direction by describing the similarities and differences by race according to these characteristics in 39 HNSCC patients near the time of surgery. Focusing solely on surgical patients helps to eliminate receipt of definitive treatment as an explanatory factor. With the advent of the eighth edition of the American Joint Committee on Cancer (AJCC), understanding these factors is paramount in developing modernized treatment guidelines.²⁰ The purpose of this study was to characterize AA-EA similarities and differences in sociodemographic, lifestyle, clinical, and psychosocial characteristics in HNSCC patients near the time of surgery at a single tertiary care center.

Methods

Study Design

This study was a cross-sectional investigation of 39 newly diagnosed, untreated HNSCC patients ($n = 24$ EAs, $n = 15$ AAs). The research was guided by a conceptual model that accounted for a comprehensive set of factors that may be related to racial differences in HNSCC. A patient questionnaire containing sociodemographic, lifestyle, psychosocial and health care access questions was administered preoperatively and clinical data were abstracted from the patients' electronic medical record using a standardized

chart review data abstraction form. The study was approved by the Institutional Review Board of the Medical University of South Carolina.

Study population

This was a cross-sectional survey study with prospective collection of clinical data carried out at the Hollings Cancer Center of the Medical University of South Carolina. The eligible patient population was comprised of those (1) with a new diagnosis of HNSCC with primary tumors of the oral cavity, oropharynx, larynx, or hypopharynx; (2) planning to undergo surgery as a part of their definitive treatment; (3) at least 18 years of age and capable of informed consent; (4) who spoke English as their primary language; (5) who received no prior treatment for their cancer; (6) with no prior history of other cancers; and (7) with African American or European American ancestry. Potential participants were approached during routine treatment planning visits by research staff to discuss the study and complete informed consent paperwork if interested.

Data collection

Sociodemographic variables

During their initial visit demographic information including race, age, gender, education, employment status, income, marital status, and insurance status were assessed. Education status was stratified by whether or not the patient graduated high school. Employment status categories included: unemployed/disabled, employed, or retired. Income categories included whether household income was greater or less than \$25000. Marital status was defined as married or not, and widowed or divorced patients were not separated from single patients.

Lifestyle factors

Lifestyle behaviors were assessed using selected questions from the Behavioral Risk Factor Surveillance System (BRFSS).²¹ Tobacco use was assessed using questions concerning ever use (whether participant had smoked at least 100 cigarettes in lifetime), current use (everyday, some days or not at all) and time since quit. We also assessed drinking status and binge drinking (whether participant drank 4 or 5 drinks in one occasion for men and women, respectively). Lastly, we assessed average physical activity using the Godin Leisure-Time questionnaire and average number of fruit and vegetable servings per day.²²

Clinical factors

Health care access. Health care access was measured by self-report using several investigator-developed items to assess whether the respondent had experienced a gap in health insurance coverage in the past 10 years or an inability to see a physician when desired over the past 2 years. We also assessed whether the respondent had an established primary care physician before diagnosis and when he or she had the most recent routine check-up. Data abstracted from the medical record included type of cancer, stage at diagnosis, anatomic site, HPV status, comorbidities, body mass index and time to treatment (as

defined as time from date of diagnosis to start of first treatment modality).

Psychosocial factors

Perceived Stress. Perceived Stress was assessed using the 10-item Perceived Stress Scale.²³ This widely used instrument assesses the degree to which situations in one's life were appraised as stressful during the last month (1 = Never to 5 = Very Often) and has demonstrated suitable psychometric properties. **Fatalism** was assessed using the 5-item Fatalism Scale.²⁴ These items examine frequency of fatalistic beliefs about one's health in the context of a cancer diagnosis. Each item (e.g., "I've given up trying to get better") used a Likert-type scale, ranging from 1 (not at all) to 5 (extremely) with higher scores indicating greater level of fatalism.

Social support. Social support was assessed with the (ISEL-12).²⁵ This instrument includes 12 statements concerning the perceived availability of potential social resources and provides an overall measure of support as well as perceived availability of three separate functions of social support including appraisal, tangible and belonging support. Participants reported the extent to which statements about support were true for them (1 = Definitely False to 4 = Definitely True).

Statistical analysis

Descriptive statistics were used to summarize variables and determine difference between the two groups (AAs versus EAs). For categorical variables, Fisher's exact test or Wilcoxon Rank Sum tests were performed to assess significance. For continuous variables, *t*-tests were performed for normally distributed data points and Mann-Whitney or Kruskal-Wallis for non-normal distributions. All statistical analysis was performed on SAS version 9.4 and SPSS version 24.0 (IBM Corp., Armonk, NY).

Results

Demographic differences in European American and African American patients

The frequency distributions of the sociodemographic and lifestyle variables are summarized in Table 1. The mean age was 60.7 years in European Americans (EAs) and 58.3 years in African Americans (AAs). The majority of patients for both races were male, but more AAs were male compared with EAs (79% vs. 65% males). Compared with EAs, AAs had significantly lower levels of formal schooling ($P = 0.01$) and higher levels of unemployment ($P = 0.049$). AAs compared with EAs had lower income levels and were less likely to be married but these differences were not statistically significant. With respect to tobacco smoking and alcohol drinking, AAs were slightly more likely to have been ever smokers but less likely to be current smokers, less likely to be current drinkers but more likely to binge drink if they were current drinkers. With respect to lifestyle characteristics, both racial groups had similar levels of exercise and

Table 1 Frequency distributions of demographic and lifestyle characteristics of head and neck cancer patients by race.

Factors	European American (n = 24)	African American (n = 15)	P-value
Age (years)			
Average Age	60.7	58.3	0.55 ^a
≤65	61%	80%	
>65	39%	20%	
Missing	1	0	
Gender			
Male	65%	79%	0.48 ^b
Female	35%	21%	
Missing	1	1	
Education			
<High School Graduate	8%	50%	0.01 ^b
≥High School Graduate	92%	50%	
Missing	0	5	
Employment			
Unemployed/Disability	38%	80%	0.049 ^b
Employed	29%	20%	
Retired	33%	0	
Missing	0	5	
Average Income(\$)			
≤25000	35%	50%	0.46 ^b
>25000	65%	50%	
Missing	1	5	
Marital Status			
Married	63%	50%	0.70 ^b
Not Married (Single/ Wid./Div.)	37%	50%	
Missing	0	5	
Smoking Status			
Never	21%	20%	0.34 ^b
Former	46%	20%	
Current	33%	60%	
Missing	0	5	
Alcohol Use			
Never	13%	10%	0.10 ^b
Former	8%	40%	
Current	79%	50%	
Missing	0	5	
Binge Drinking			
No	39%	20%	0.62 ^b
Yes	61%	80%	
Missing	6	10	
Exercise			
No Exercise	25%	30%	0.96 ^b
Mild	37%	30%	
Moderate	25%	20%	
Strenuous	13%	20%	
Missing	0	5	

Table 1 (continued)

Factors	European American (n = 24)	African American (n = 15)	P-value
Diet			
Average Fruit Consumption	1.8	2.4	0.24 ^a
Average Vegetable Consumption	2.1	1.8	0.64
Missing	0	5	
BMI			
Average BMI	27.4	23.9	0.054 ^a
<18.5	9%	21%	
18.5–24.9	26%	29%	
25.0–29.9	30%	43%	
≤30.0	35%	7%	
Missing	1	1	

^a = *t*-test.^b = Fisher's exact test.

consumption of fruits and vegetables. AAs had a mean body mass index that was 13% lower than EAs (*P*-value 0.054).

Features of disease between European American and African American patients

The frequency distributions of the clinical characteristics showed little difference between EAs and AAs for anatomic site of the tumor and HPV status of the tumor (Table 2). Interestingly, the clinical stage of the tumor was much more similar between AAs and EAs than the pathologic state, which showed a marked trend toward late-stage disease in AAs compared with EAs. Median time to treatment was significantly shorter for EAs (33 IQR: 20-42) compared to AAs (55 IQR: 25-74) (*P* = 0.05).

Distribution of HPV-related diseases in European American and African American patients

A subset of 20 patients in this study had available data for race and HPV status. Of note, 100% of AA HPV + patients had oral cavity cancer but 100% of HPV + EA patients had oropharyngeal cancer (Table 3). AA patients that were HPV- had disease either of the oral cavity (33%) and oropharynx (67%). EA patients that were HPV- had disease more commonly in oral cavity (64%) and other sites of the head and neck (36%).

Psychosocial differences in European American and African American patients

With respect to psychosocial characteristics, the two racial groups were similar with respect to overall social support as well as the individual components of appraisal, belonging, and tangible support (Table 4). AAs had a mean religiosity score that was 18% higher than EAs, a difference that was

Table 2 Comparison of clinical characteristics of head and neck cancer patients by race.

Factors	European American (n = 24)	African American (n = 15)	P-value
Subsite			
Oral Cavity	67%	55%	0.77
Oropharynx	14%	18%	
Larynx	19%	27%	
Missing		4	
Clinical Stage			
I	30%	7%	0.22 ^a
II	22%	43%	
III	9%	21%	
IV	39%	29%	
Missing	1	1	
Pathologic Stage			
I	45%	23%	0.56 ^b
II	14%	15%	
III	9%	8%	
IV	32%	54%	
Missing	2	2	
HPV			
Negative	73%	60%	0.68
Positive	27%	40%	
Missing/Unknown	6	11	
Time to Treatment(d)			
Median (range)	33 (20–42)	55 (25–74)	0.05

^a Fisher’s test.
^b Wilcoxon Rank Sum test.

not statistically significant (*P*-value 0.19). Both racial groups had nearly equal levels of perceived stress. Compared with EAs, AAs had 21% higher level of fatalism (*P*-value 0.57).

Differences in access to healthcare in European American and African American patients

No statistically significant differences were noted with respect to access to healthcare (Table 5), but the risk profile tended to be worse for EA compared with AA patients for having a primary care physician prior to diagnosis, having a recent routine check-up, and ability to see a physician. Despite nearly equal percentages of both groups currently having insurance, AAs were more likely to report

Table 3 Comparison of race and HPV status by anatomic site (%).

Factors	Cases	Anatomic Site		
		Oral Cavity	Oropharynx	Other
HPV + EA	4	0	100	0
HPV + AA	2	100	0	0
HPV – EA	11	64	0	36
HPV – AA	3	33	67	0

Table 4 Comparison of psychosocial characteristics of head and neck cancer patients by race.

Factors	European American (n = 24)	African American (n = 15)	P-value
Social Support (%)			
Appraisal	10.0	9.8	0.87 ^a
Belonging	9.8	10.2	0.71
Tangible	8.2	8.7	0.24
Overall	27.9	28.7	0.89
Missing	0	5	
Religiosity			
Total Score	22.3	26.4	0.19 ^a
Missing	1	5	
Perceived Stress			
Total Score	17.6	17.9	0.93 ^b
Missing	0	6	
Fatalism			
Average Score	1.9	2.3	0.57 ^a

^a = Wilcoxon Rank–Sum test.
^b = *t*-test.

having a gap in health insurance during the past decade (37% vs. 15%).

Discussion

This cross-sectional pilot study was conducted among a racially diverse sample of HNSCC patients who received surgical resection to ascertain potential racial differences in the risk profile that may contribute to poorer survival among AAs compared to their EA counterparts. Unlike prior studies that primarily utilized existing retrospective medical record data, the current study was designed to explore a comprehensive array of risk factors at the: a) socio-demographic level (e.g. race, ethnicity, age, gender, marital status, years of education, employment status, family income and health insurance), b) lifestyle level (e.g. tobacco use, alcohol use, exercise and fruit/vegetable intake), c) clinical level (e.g. cancer type, stage and anatomical site, comorbidities, healthcare access, primary care provider, HPV status, BMI and time to treatment, and d) psychosocial level (e.g. perceived stress, fatalism, HNSCC symptoms and social support).^{14,26,27} To our knowledge, most prior studies that examined differences in the risk profile of HNSCC patients by race did not assess factors such as employment status, years of education, stress, social support, tobacco use, diet and exercise. Thus, the current study was designed to explore not only previously validated HNSCC risk factors, but also some novel risk factors that are understudied due to their absence in most clinical datasets.

Of the demographic factors assessed in the current study (i.e. age, gender, education, employment, income and marital status), only education and employment were statistically associated with race. In our cohort, AAs had lower levels of education and employment as compared to

Table 5 Frequency distributions of variables related to healthcare access among head and neck cancer patients by race(%).

Factors	European American (n = 24)	African American (n = 15)	P-value
Current Insurance Status			
No	17	20	0.99
Yes	83	80	
Missing	0	5	
Gap in Insurance Coverage in Last 10 Years			
No	85	63	0.31
Yes	15	37	
Missing	4	7	
Had a Primary Physician Prior to Cancer Diagnosis			
No	25	10	0.64
Yes	75	90	
Missing	0	5	
Last Routine Check-up Prior to Diagnosis			
≤1 Year	75	90	0.64
>1 Year	25	10	
Missing	0	5	
Unable to See a Physician Despite Wanting To in the Last 2 Years			
No	65	78	0.68
Yes	35	22	
Missing	1	6	

EAs. This finding suggests that social deprivation may be an important factor to examine in the future in terms of risk for HNSCC.

Lifestyle factors assessed in the current study included fruit and vegetable consumption, physical activity, tobacco use, alcohol use and BMI. There was no racial differences identified in terms of fruit/vegetable consumption and exercise. This finding conflicts with some prior studies but support findings from other studies.^{28,29} In our cohort, AAs had lower BMI than EAs as well.

Our study noted that 70% of EA patients and 60% AA patients were HPV negative. The majority of new head and neck cancer diagnoses are HPV related, however this data was collected at a time when HPV was not routinely tested at this institution.⁶ As such, many patients did not have documented HPV status. Interestingly 100% of HPV + AA patients had oral cavity cancer, and the prognostic significance of HPV status on sites other than the oropharynx is still not well known.^{30,31} Furthermore all AA patients with oropharynx cancer were HPV negative, a disease with much poorer prognosis compared to HPV + disease corroborating similar reports.^{11,32} In contrast all HPV + EA patients had oropharyngeal cancer, which has been well described and is expected.^{7,10}

This study found many more similarities in access to care, psychosocial characteristics, and insurance status than differences. However, in our limited cohort, AA patients had lower levels of formal schooling and higher levels of unemployment; findings similar to previously reported

cohorts.^{26,33} There was no difference in overall social support, however perceived fatalism was slightly higher in AA patients. One key difference in socioeconomic status was that AA patients were more likely to have a gap in their insurance consistent with previous research.^{14,16}

In the current study, AAs were more likely than EAs to experience cancer upstaging between clinical and pathological diagnosis. While the underlying reason for this finding is unclear, this finding warrants further investigation in a larger more controlled study. It is possible that AAs are more likely to experience cancer upstaging between clinical and pathological diagnosis due to underlying genetic differences. In other cancers such as prostate and breast cancer, the presence of more aggressive disease has been implicated as a predictor of poorer survival in AAs.^{34,35} It is also possible that AAs are more likely to experience cancer upstaging between diagnosis and surgery due to differences in quality of diagnostic work up. Specifically, factors such as time between diagnosis and surgery, array of diagnostic test and characteristics of the medical settings and professionals who perform diagnostic work-up should be investigated in future research. AAs in this study were found to have significantly increased time to treatment initiation as well.

Limitations

A number of strengths and weaknesses should be considered in interpreting the results from this study. A key strength of the study was the holistic approach that was utilized on a small scale as a model to ramp up in larger studies and the use of validated questionnaires. Key weakness of the study was the small sample size with substantial amounts of missing data. Most specifically there is limited information on HPV status. Due to the limited sample size, generalization of our findings requires further work with a larger cohort.

Conclusions

This prospective study highlights important similarities and differences of patients with head and neck cancer prior to treatment. Disparities appear to continue to exist by race in a number of clinical and psychosocial variables that deserve further attention and research. Future prospective work investigating racial disparities in head and neck cancer patients should be encouraged. Elucidating factors can lead to potential public health interventions that may be implemented to reduce disparities.

Key points

Questions: Which racial differences in epidemiological, clinical, and psychosocial contributors can be accounted for prior to treatment in patients undergoing surgery for HNSCC in a cross-sectional study at a single NCI-designated tertiary care center?

Findings: Time to treatment initiation and gaps in health insurance were significantly higher, formal education was significantly lower for African American patients in this

cross sectional study. Furthermore, African American patients were more likely to have a higher pathologic stage as well.

Meaning: Many similarities and some key differences in sociodemographic, lifestyle, clinical, and psychosocial characteristics in African American and European American patients near the time of surgery for head and neck squamous cell carcinoma.

Presentations

None.

Declaration of Competing Interest

None.

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