Received: 10 December 2023 | Accepted: 25 February 2024

DOI: 10.1002/wjo2.178

RESEARCH PAPER

World Journal of Otorhinolaryngology-Head and Neck Surgery

Racioethnic disparities in comorbidities and outcomes following head and neck oncologic surgery

Usama Waqar[1,2] | Aahan Arif[1] | Ayesha N. Hameed[1] | Syeda M. A. Zaidi[1] | Muhammad Hamza[1] | Haissan Iftikhar[3] | Huma Naz[4] | Syed A. Abbas[5]

[1]Medical College, Aga Khan University, Karachi, Pakistan

[2]Department of Surgery, The Ohio State University Wexner Medical Center and James Comprehensive Cancer Center, Columbus, Ohio, USA

[3]Fellow Rhinology and Skull Base, Department of Surgery, University Hospitals Birmingham, Birmingham, UK

[4]Gastroenterology and Surgery Service Line, Aga Khan University Hospital, Karachi, Pakistan

[5]Section of Otolaryngology, Head and Neck Surgery, Department of Surgery, Aga Khan University Hospital, Karachi, Pakistan

Correspondence

Usama Waqar, Medical College, Aga Khan University, Stadium Rd, Karachi 74800, Sindh, Pakistan.
Email: usama.waqar@scholar.aku.edu

Funding information

None

Abstract

Objectives: Racial disparities persist despite attempts to establish an egalitarian framework for surgical care. This study aimed to investigate racioethnic disparities in comorbidities and outcomes following surgery for head and neck tumors.

Methods: This retrospective study included adult patients who underwent head and neck oncologic surgery between 2008 and 2020 from the National Surgical Quality Improvement Program. Multivariable regression analyses were conducted to explore the association of the following racioethnic categories with postoperative outcomes: White, Black, Hispanic, and Asian.

Results: A total of 113,234 patients were included in the study, comprising 78.3% White, 8.7% Black, 6.9% Hispanic, and 6.0% Asian patients. Black patients had higher rates of pre-existing comorbidities compared to White patients. Specifically, the rates of comorbidities such as diabetes mellitus (19.8% vs. 12.4%), hypertension (57.5% vs. 41.5%), smoking history (18.8% vs. 15.0%), dyspnea (7.4% vs. 5.7%), and preoperative anemia (43.6% vs. 36.5%) were higher among Black patients. On regression analyses, Black race was not associated with major morbidity following head and neck oncologic surgeries (odds ratio, 1.098, 95% confidence interval, 0.935–1.289) when compared to White patients. However, there were significant associations between the comorbidities associated with the Black race and an increased risk of major morbidity.

Conclusions: Black patients undergoing head and neck oncologic surgery face a significant challenge due to a higher burden of comorbidities. These comorbidities, in turn, have been found to be associated with postoperative major morbidity.

KEYWORDS

comorbidity, ethnic and racial minorities, head and neck neoplasms, healthcare disparities, postoperative complications

Usama Waqar and Aahan Arif contributed equally to this work. Ayesha N. Hameed and Syeda M. A. Zaidi contributed equally to this work.

INTRODUCTION

Head and neck tumors constituted 3.5% of newly diagnosed cancers in the United States in 2020.[1] These tumors predominantly affect the upper aerodigestive tract, leading to difficulties in speech, swallowing, or breathing, along with disfigurement. The primary treatment approaches involve extensive surgical resection and radiotherapy; however, they are not without complications.[2,3] Additionally, patients with head and neck tumors often have medical comorbidities and nutritional deficiencies, which can contribute to increased postoperative morbidity.[2,3] Evidence suggests that up to 40% of patients may experience early postoperative morbidity.[4] Major morbidity not only poses significant health risks, including death but also results in treatment delays and emotional distress for patients and their families.

In the United States, several initiatives have been implemented to establish an egalitarian framework for surgical care, such as the Affordable Care Act,[5] the Health Equity and Accountability Act,[6] the Office of Minority Health, and the National Partnership for Action to End Health Disparities. Despite these efforts, disparities in access to care persist among patients with head and neck tumors with certain racioethnic populations being particularly vulnerable. Previous evidence highlights substantial disparities in mortality rates for laryngeal and oropharyngeal cancer, with higher rates observed in Black male patients compared to their White counterparts. For instance, the mortality rate for laryngeal cancer is 1.7 per 100,000 for White patients, while it doubles to 3.2 per 100,000 for Black male patients. Similarly, the mortality rate for oropharyngeal cancer is 4.0 per 100,000 for White men and 4.8 per 100,000 for Black men.[1]

The causes of disparities among head and neck neoplasm patients are likely multifaceted, influenced by both biological and socioeconomic factors that impact outcomes. Black patients are more frequently diagnosed with advanced-stage diseases than White patients.[7–9] Furthermore, Black patients are more likely to receive inadequate care, experience greater delays in guideline-concordant care, and bear a heavier comorbidity burden.[10–12] Most studies that explore racial disparities among patients with head and neck tumors have, however, focused primarily on oncologic outcomes.[7–9,13] To our knowledge, little is currently known about racioethnic disparities in comorbidities and surgical outcomes in this specific patient population.

The objective of this study was to investigate racioethnic disparities in comorbidities and outcomes following surgery for head and neck tumors, utilizing a large, multi-institutional database.

METHODS

Ethics approval

This study was conducted following exemption from the Ethics Review Committee at the Aga Khan University, Karachi, Pakistan (ERC# 2022-7075-20400).

Study design

This multicenter retrospective cohort study used clinical data from the National Surgical Quality Improvement Program (NSQIP) database. NSQIP is a multi-institutional program founded by the American College of Surgeons (ACS) to assess surgical outcomes in collaboration with 700 hospitals worldwide. Data are procured at each hospital by trained surgical reviewers through an externally validated process using standardized protocols.[14]

Study cohort

This study included all patients 18 years or older who underwent a head and neck oncologic procedure from January 1, 2008, until December 31, 2020. To identify cases for capture, a comprehensive list of Current Procedural Terminology (CPT) codes of head and neck oncologic procedures was created. This included the following procedures: laryngectomy, hemi laryngectomy, neck dissection, surgery for tumors of the oral cavity, parotidectomy, surgery for tumors of the submandibular gland, cutaneous tumors of the head and neck, thyroidectomy, parathyroidectomy, pharynx tumors, and tracheal tumors (Supporting Information S1: Table S1). We excluded procedures where the primary specialty of the surgeon was not coded as "Otolaryngologist" and cases where the ethnicity/race of patients could not be determined. Moreover, due to limited sample sizes, we excluded Native American or Alaska Native and Native Hawaiian or Pacific Islander patients from the analyses. Lastly, emergency surgeries were excluded from this study. Details regarding cohort creation are available in Figure 1.

Patient characteristics

Demographic characteristics of patients included age, gender, race, ethnicity, and body mass index (BMI). Initially, all patients were

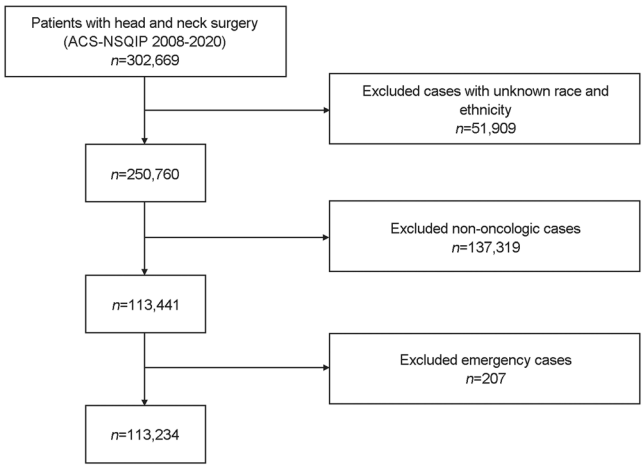

FIGURE 1 Cohort creation diagram. ACS-NSQIP, American College of Surgeons National Surgical Quality Improvement Program.

grouped based on their Hispanic status, distinguishing between Hispanic and non-Hispanic individuals. Subsequently, within the non-Hispanic group, further categorization was conducted based on racial backgrounds, including White, Black or African American, and Asian. The final racioethnic categories encompassed White, Black or African American, Hispanic, and Asian patients.

Preoperative characteristics of patients included American Society of Anesthesiology (ASA) physical status, chronic steroid use, diabetes mellitus, hypertension, smoking status, dyspnea, chronic obstructive pulmonary disease (COPD), and preoperative anemia. Operative characteristics included wound classification, operative time, type of operation, need for concurrent tracheotomy, and surgical indication. The following CPT codes were used to identify concurrent tracheotomy: 31600, 31603, and 31610. Surgical indications were categorized as benign or malignant based on the International Classification of Disease, Ninth and Tenth Revision (ICD-9 and ICD-10, respectively) codes. Anemia was defined as a hematocrit level below 39% for males and below 36% for females.[15]

Outcomes

The primary outcomes investigated were 30-day postoperative mortality and morbidity, including major adverse cardiovascular events, wound events, renal events, sepsis/septic shock, venous thromboembolism/pulmonary embolism (PE), pulmonary events (unplanned or prolonged [>48 h] intubation), and transfusion requirement. Major morbidities were defined as deep or organ space surgical site infection (SSI), wound dehiscence, PE, ventilation longer than 48 h after surgery, unplanned reintubation, acute renal failure, progressive renal insufficiency, sepsis, septic shock, myocardial infarction (MI), cardiac arrest requiring cardiopulmonary resuscitation (CPR), and cerebrovascular accident (CVA). Overall morbidity included all major complications in addition to superficial SSI, pneumonia, urinary tract infection (UTI), intraoperative or postoperative blood transfusion, and deep venous thrombosis (DVT) regarding therapy. Infectious complications included SSI, sepsis, septic shock, UTI, pneumonia, and wound dehiscence. Noninfectious complications included MI, cardiac arrest, prolonged ventilator dependence, unplanned reintubation, progressive renal insufficiency, acute renal failure, PE, and DVT. Other outcomes included 30-day unplanned readmission and 30-day unplanned reoperation. Unplanned readmission and reoperation were not limited to the index hospital.

Statistical analysis

Descriptive statistics were reported for quantitative variables as median (IQR) while categorical variables were described as frequencies and percentages. Continuous variables such as age and length of stay were categorized based on clinically important thresholds. Univariate analyses were performed using the Mann–Whitney *U* test for continuous variables and χ^2 test for categorical variables across multiple racioethnic groups in comparison with the White race.

Multivariable regression was performed to assess the association of different risk factors with major morbidity. Multivariable regression models were also computed to assess the effects of racioethnic status on overall morbidity, infectious complications, noninfectious complications, unplanned readmission, and unplanned reoperation. White race was used as the reference category in these regression analyses. Regression was not performed for the following surgical subgroups due to small sample sizes or the number of events: hemi-laryngectomy ($n = 89$); surgery for tumors of the submandibular gland (small event sizes); cutaneous tumors of head and neck (small event sizes); and pharynx tumors ($n = 120$). These multivariable regression models were adjusted for clinically relevant covariates occurring before outcomes, including gender, age, BMI, diabetes mellitus, smoking, hypertension, chronic steroid use, dyspnea, COPD, preoperative anemia, operative time, concurrent tracheotomy, surgical indication, ASA physical status, and wound classification. These covariates were selected a priori based on clinical relevance. Only cases with complete data on all covariates were included in regression models.

Data analyses and management were performed using the IBM SPSS (Statistical Package for Social Sciences) Version 26. Statistical significance was assessed at two-sided $p < 0.05$ following correction for multiple hypotheses testing using the Holm–Bonferroni method.

RESULTS

Demographic and patient characteristics

In this study, a total of 113,234 patients were included. The median age of the participants was 56.0 (IQR, 23.0) years, with a majority being females ($n = 66{,}090$, 58.4%). When considering racioethnic groups, the largest representation was observed among White patients ($n = 88{,}673$, 78.3%), followed by Black ($n = 9901$, 8.7%), Hispanic ($n = 7825$, 6.9%), and Asian patients ($n = 6835$, 6.0%). Patient characteristics are described in Table 1. White patients were older compared to other racioethnic groups, with a median age of 57.0 years (IQR, 22.0 years). When comparing BMI, Black patients had a higher median compared to White patients (30.7 [IQR, 10.1] vs. 28.6 [IQR, 8.8] kg/m^2; $p < 0.001$), while Asian patients had a relatively lower median BMI (25.1 [IQR, 5.8] kg/m^2; $p < 0.001$). Furthermore, compared to White patients, Black patients showed a higher prevalence of diabetes mellitus (12.4% vs. 19.8%; $p < 0.001$), hypertension (41.5% vs. 57.5%; $p < 0.001$), smoking history (15.0% vs. 18.8%; $p < 0.001$), dyspnea (5.7% vs. 7.4%; $p < 0.001$), and preoperative anemia (36.5% vs. 43.6%; $p < 0.001$). Hispanic patients were also more likely than White patients to have diabetes mellitus (17.2% vs. 12.4%; $p < 0.001$), although the prevalence of other comorbidities remained relatively low among Hispanic patients. Similarly, when compared to their White counterparts, Asian patients exhibited a lower prevalence of comorbidities other than diabetes mellitus.

TABLE 1 Demographic and preoperative characteristics by racioethnic group.

Variable	White (*n* = 88,673) *n* (%)	Black (*n* = 9901) *n* (%)	*p* Value	Hispanic (*n* = 7825) *n* (%)	*p* Value	Asian (*n* = 6835) *n* (%)	*p* Value	Overall (*n* = 113,234) *n* (%)
Age (years)[a]	57.0 (22.0)	55.0 (21.0)	<0.001	50.0 (22.0)	<0.001	50.0 (23.0)	<0.001	56.0 (23.0)
Missing (*n*)	59	2		1		1		63
Age (years)			<0.001		<0.001		<0.001	
<60	49,500 (55.9)	6169 (62.3)		5642 (72.1)		4779 (69.9)		66,090 (58.4)
≥60	39,114 (44.1)	3730 (37.7)		2182 (27.9)		2055 (30.1)		47,081 (41.6)
Missing (*n*)	59	2		1		1		63
Gender			<0.001		<0.001		<0.001	
Female	56,655 (63.9)	7334 (74.1)		5823 (74.4)		4847 (70.9)		74,659 (65.9)
Male	31,993 (36.1)	2565 (25.9)		2002 (25.6)		1986 (29.1)		38,546 (34.0)
Missing (*n*)	25	2		0		2		29
BMI (kg/m^2)[a]	28.6 (8.8)	30.7 (10.1)	<0.001	29.4 (8.1)	<0.001	25.1 (5.8)	<0.001	28.5 (8.8)
Missing (*n*)	476	61		38		41		619
BMI (kg/m^2)			<0.001		<0.001		<0.001	
Healthy (18.5-<25.0)	22,617 (25.6)	1651 (16.8)		1480 (19.0)		3171 (46.7)		28,984 (25.5)
Underweight (<18.5)	1264 (1.4)	152 (1.5)		45 (0.6)		191 (2.8)		1658 (1.5)
Overweight (25.0-<30.0)	27,776 (31.5)	2768 (28.1)		2690 (34.5)		2317 (34.1)		35,606 (31.4)
Obese (30.0 or higher)	36,540 (41.4)	5269 (53.5)		3572 (45.9)		1115 (16.4)		46,573 (41.1)
Missing (*n*)	476	61		38		41		619
ASA classification			<0.001		<0.001		<0.001	
ASA 1-2	53,225 (60.2)	4954 (50.1)		5049 (64.6)		5090 (74.6)		68,318 (60.5)
ASA 3-5	35,210 (39.8)	4929 (49.9)		2771 (35.4)		1735 (25.4)		44,645 (39.5)
Missing (*n*)	238	18		5		10		271
Chronic steroid use	2353 (2.7)	300 (3.0)	0.028	148 (1.9)	<0.001	114 (1.7)	<0.001	2915 (2.6)
Diabetes mellitus	11,029 (12.4)	1957 (19.8)	<0.001	1347 (17.2)	<0.001	998 (14.6)	<0.001	15,331 (13.5)
Hypertension	36,801 (41.5)	5698 (57.5)	<0.001	2837 (36.3)	<0.001	2316 (33.9)	<0.001	47,652 (42.1)
Smoking status	13,307 (15.0)	1866 (18.8)	<0.001	780 (10.0)	<0.001	516 (7.5)	<0.001	16,469 (14.5)
Dyspnea	5027 (5.7)	729 (7.4)	<0.001	211 (2.7)	<0.001	211 (3.1)	<0.001	6178 (5.5)
COPD	2893 (3.3)	286 (2.9)	0.046	101 (1.3)	<0.001	37 (0.5)	<0.001	3317 (2.9)
Preoperative anemia	32,381 (36.5)	4317 (43.6)	<0.001	2474 (31.6)	<0.001	2512 (36.9)	0.697	41,783 (36.8)
Missing (*n*)	25	2		0		2		29

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index; COPD, chronic obstructive pulmonary disease.

[a]Reported with median and interquartile range; percentages are presented in columns; *p* values are for comparison of outcomes across multiple racioethnic groups with Whites.

Operative characteristics

Table 2 provides an overview of the operative characteristics observed in the study. Among the procedures performed, thyroidectomy was the most common, accounting for 58.4% (*n* = 66,206) of cases, followed by parathyroidectomy (13.0%, *n* = 14,665) and neck dissection (10.3%, *n* = 11,661). Most patients had malignant tumors (*n* = 72,226, 63.7%). White patients were found to have a higher likelihood of clean-contaminated wound classification (*n* = 11,272, 12.7%; $p < 0.001$) compared to other groups. Black patients had a higher rate of parathyroidectomy compared to White patients (20.0% vs. 13.0%; $p < 0.001$), while Hispanic and Asian patients were more likely to undergo thyroidectomy than their White counterparts (66.5% and 68.7% vs. 57.2%; $p < 0.001$). Concurrent tracheotomy

TABLE 2 Operative characteristics by racioethnic group.

Variable	White (*n* = 88,673) *n* (%)	Black (*n* = 9901) *n* (%)	*p* Value	Hispanic (*n* = 7825) *n* (%)	*p* Value	Asian (*n* = 6835) *n* (%)	*p* Value	Overall (*n* = 113,234) *n* (%)
Wound classification			<0.001		<0.001		<0.001	
Clean	76,800 (86.6)	8763 (88.5)		7042 (90.0)		6083 (89.0)		98,688 (87.2)
Clean-contaminated	11,272 (12.7)	1078 (10.9)		739 (9.4)		702 (10.3)		13,791 (12.2)
Contaminated	476 (0.5)	46 (0.5)		39 (0.5)		41 (0.6)		602 (0.5)
Dirty/infected	125 (0.1)	14 (0.1)		5 (0.1)		9 (0.1)		153 (0.1)
Operative time (min)[a]	109.0 (94.0)	107.0 (88.0)	0.168	114.0 (94.0)	<0.001	125.0 (102.0)	<0.001	110.0 (94.0)
Missing (*n*)	9	0		0		0		9
Type of operation			<0.001		<0.001		<0.001	
Laryngectomy	790 (0.9)	169 (1.7)		42 (0.5)		42 (0.6)		1043 (0.9)
Hemi laryngectomy	70 (0.1)	10 (0.1)		7 (0.1)		2 (0.0)		89 (0.1)
Neck dissection	9754 (11.0)	645 (6.5)		737 (9.4)		525 (7.7)		11,661 (10.3)
Surgery for tumors of the oral cavity	5076 (5.7)	397 (4.0)		292 (3.7)		368 (5.4)		6133 (5.4)
Parotidectomy	8904 (10.0)	833 (8.4)		658 (8.4)		726 (10.6)		11,121 (9.8)
Surgery for tumors of the submandibular gland	543 (0.6)	86 (0.9)		55 (0.7)		74 (1.1)		758 (0.7)
Cutaneous tumors of the head and neck	1176 (1.3)	153 (1.5)		75 (1.0)		34 (0.5)		1438 (1.3)
Thyroidectomy	50,691 (57.2)	5616 (56.7)		5202 (66.5)		4696 (68.7)		66,206 (58.4)
Parathyroidectomy	11,568 (13.0)	1978 (20.0)		753 (9.6)		366 (5.4)		14,665 (13.0)
Pharynx tumors	101 (0.1)	13 (0.1)		4 (0.1)		2 (0.0)		120 (0.1)
Concurrent tracheotomy	1323 (1.5)	189 (1.9)	0.003	92 (1.2)	0.052	96 (1.4)	0.565	1700 (1.5)
Surgical indication			<0.001		<0.001		<0.001	
Benign	32,040 (36.1)	4,872 (49.2)		2409 (30.8)		1823 (26.7)		41,215 (36.3)
Malignant	56,633 (63.9)	5029 (50.8)		5416 (69.2)		5012 (73.3)		72,226 (63.7)

[a]Reported with median and interquartile range; percentages are presented in columns; *p* values are for comparison of outcomes across multiple racioethnic groups with Whites.

was more frequently performed for Black patients compared to White patients (1.9% vs. 1.5%; $p = 0.003$).

Univariate analyses for 30-day outcomes

A total of 1927 individuals (1.7%) experienced postoperative major morbidity, 207 (0.2%) had mortality, 1977 (3.2%) required unplanned readmission, and 2654 (2.3%) required unplanned reoperation (Table 3). Major morbidity was significantly more common among Black patients compared to White patients (2.2% vs. 1.7%; $p < 0.001$), while Hispanic patients had a lower incidence of major morbidity compared to White patients (1.1% vs. 1.7%; $p < 0.001$). Black patients also exhibited higher rates of noninfectious complications, including pulmonary complications (1.0% vs. 0.6%; $p < 0.001$) and vascular complications (0.4% vs. 0.3%; $p < 0.001$), in comparison to their White counterparts. Moreover, Black patients had a higher likelihood of requiring blood transfusion (1.8% vs. 1.0%; $p < 0.001$), experiencing unplanned readmission (3.8% vs. 3.2%; $p < 0.001$), and undergoing unplanned reoperation (2.8% vs. 2.4%; $p < 0.001$). Conversely, Hispanic and Asian patients demonstrated a lower likelihood of requiring unplanned reoperation compared to White patients (1.7% and 1.8% vs. 2.4%, respectively; $p < 0.001$ and 0.004).

Multivariable regression analyses

On regression analyses, underweight BMI (odds ratio [OR]: 1.380, 95% confidence interval [CI]: 1.079–1.764), age 60 years or older (OR: 1.297, 95% CI: 1.160–1.449), and ASA physical statuses 3–5

TABLE 3 Univariate analysis of 30-day postoperative outcomes by racioethnic group.

Variable	White (*n* = 88,673) *n* (%)	Black (*n* = 9901) *n* (%)	*p* Value	Hispanic (*n* = 7825) *n* (%)	*p* Value	Asian (*n* = 6835) *n* (%)	*p* Value	Overall (*n* = 113,234) *n* (%)
Major morbidity	1508 (1.7)	220 (2.2)	<0.001	89 (1.1)	<0.001	99 (1.4)	0.118	1927 (1.7)
Overall morbidity	3231 (3.6)	440 (4.4)	<0.001	218 (2.8)	<0.001	236 (3.5)	0.416	4144 (3.7)
Infectious complications	2033 (2.3)	217 (2.2)	0.523	134 (1.7)	0.003	145 (2.1)	0.722	2540 (2.2)
Surgical site infection	1119 (1.3)	98 (1.0)	0.060	76 (1.0)	0.052	93 (1.4)	0.482	1389 (1.2)
Superficial	744 (0.8)	55 (0.6)	0.009	52 (0.7)	0.204	63 (0.9)	0.472	914 (0.8)
Deep incisional	246 (0.3)	26 (0.3)	0.790	12 (0.2)	0.126	17 (0.2)	>0.999	301 (0.3)
Organ/space	145 (0.2)	18 (0.2)	>0.999	12 (0.2)	0.831	14 (0.2)	>0.999	189 (0.2)
Sepsis	235 (0.3)	38 (0.4)	0.099	12 (0.2)	0.122	17 (0.2)	0.800	302 (0.3)
Septic shock	69 (0.1)	6 (0.1)	>0.999	3 (0.0)	0.660	4 (0.1)	0.578	82 (0.1)
Urinary tract infection	296 (0.3)	30 (0.3)	0.613	22 (0.3)	>0.999	19 (0.3)	0.876	367 (0.3)
Pneumonia	433 (0.5)	65 (0.7)	0.075	30 (0.4)	0.396	31 (0.5)	0.690	559 (0.5)
Wound disruption	262 (0.3)	43 (0.4)	0.036	8 (0.1)	0.006	12 (0.2)	0.074	325 (0.3)
Noninfectious complications	900 (1.0)	148 (1.5)	<0.001	61 (0.8)	0.088	58 (0.8)	0.183	1173 (1.0)
Cardiac complications	176 (0.2)	29 (0.3)	0.100	4 (0.1)	0.012	13 (0.2)	0.882	223 (0.2)
Myocardial infarction	107 (0.1)	8 (0.1)	0.540	3 (0.0)	0.117	9 (0.1)	0.801	127 (0.1)
Cardiac arrest	84 (0.1)	22 (0.2)	<0.001	1 (0.0)	0.038	4 (0.1)	0.342	111 (0.1)
Pulmonary complications	559 (0.6)	99 (1.0)	<0.001	42 (0.5)	0.626	42 (0.6)	0.873	748 (0.7)
Ventilator >48 h	310 (0.3)	63 (0.6)	<0.001	23 (0.3)	0.842	26 (0.4)	0.679	422 (0.4)
Unplanned reintubation	387 (0.4)	57 (0.6)	0.150	29 (0.4)	0.788	31 (0.5)	0.836	504 (0.4)
Renal complications	80 (0.1)	5 (0.1)	0.404	2 (0.0)	0.180	8 (0.1)	0.481	95 (0.1)
Progressive renal insufficiency	49 (0.1)	5 (0.1)	0.848	2 (0.0)	0.874	7 (0.1)	0.357	63 (0.1)
Acute renal failure	32 (0.0)	0 (0.0)	0.177	0 (0.0)	0.216	1 (0.0)	0.729	33 (0.0)
Vascular complications	234 (0.3)	38 (0.4)	0.093	19 (0.2)	0.727	10 (0.1)	0.128	304 (0.3)
Pulmonary embolism	106 (0.1)	12 (0.1)	0.964	5 (0.1)	0.328	3 (0.0)	0.222	126 (0.1)
DVT/Thrombophlebitis	148 (0.2)	28 (0.3)	0.030	14 (0.2)	0.804	7 (0.1)	0.404	197 (0.2)
Cerebrovascular accident	78 (0.1)	5 (0.1)	0.446	3 (0.0)	0.438	5 (0.1)	0.689	91 (0.1)
Blood transfusion	851 (1.0)	178 (1.8)	<0.001	51 (0.7)	0.014	86 (1.3)	0.016	1166 (1.0)
Mortality	176 (0.2)	19 (0.2)	0.886	9 (0.1)	0.448	3 (0.0)	0.006	207 (0.2)
Unplanned readmission	1492 (3.2)	208 (3.8)	0.042	142 (2.8)	0.218	135 (3.0)	0.556	1977 (3.2)
Missing (*n*)	41,980	4461		2722		2390		51,553
Unplanned reoperation	2127 (2.4)	273 (2.8)	0.028	130 (1.7)	<0.001	124 (1.8)	0.004	2654 (2.3)
Missing (*n*)	2	1		0		0		3

Note: Percentages are presented in columns; *p* values are for comparison of outcomes across multiple racioethnic groups with Whites.
Abbreviation: DVT, deep vein thrombosis.

(OR: 2.045, 95% CI: 1.801–2.323) were found to be associated with increased odds of major morbidity (Table 4). Most comorbidities were significantly associated with major morbidity, including diabetes mellitus, hypertension, smoking, dyspnea, COPD, and preoperative anemia. Among operative characteristics, longer operative time, concurrent tracheotomy, and worse wound classifications were also associated with a higher likelihood of major morbidity. Patients undergoing laryngectomy were found to have higher odds of developing major morbidity compared to those undergoing neck dissection, parotidectomy, surgery for tumors of the submandibular gland, surgery for cutaneous tumors, and thyroidectomy. Notably, race was not

TABLE 4 Multivariable regression model for risk factors of major morbidity.

	Major morbidity	
Variable	**Adjusted odds ratio**	***p* Value**
Gender		
Female	Reference	
Male	1.108 [0.995–1.233]	0.061
BMI (kg/m^2)		
Healthy (18.5-<25.0)	Reference	
Underweight (<18.5)	1.380 [1.079–1.764]	0.010
Overweight (25.0-<30.0)	0.911 [0.800–1.037]	0.160
Obese (30 or higher)	0.956 [0.839–1.089]	0.497
Age (years)		
<60	Reference	
≥60	1.297 [1.160–1.449]	<0.001
ASA classification		
ASA 1-2	Reference	
ASA 3-5	2.045 [1.801–2.323]	<0.001
Race		
White	Reference	
Hispanic	0.835 [0.666–1.047]	0.119
Black	1.098 [0.935–1.289]	0.254
Asian	1.056 [0.848–1.315]	0.626
Chronic steroid use	1.186 [0.939–1.497]	0.152
Diabetes mellitus	1.452 [1.283–1.644]	<0.001
Hypertension	1.277 [1.143–1.427]	<0.001
Smoker status	1.249 [1.107–1.410]	<0.001
Dyspnea	1.642 [1.405–1.918]	<0.001
COPD	1.273 [1.058–1.531]	0.011
Preoperative anemia	1.195 [1.082–1.320]	<0.001
Operative time	1.004 [1.003–1.004]	<0.001
Type of operation		
Laryngectomy	Reference	
Hemi laryngectomy	1.298 [0.602–2.796]	0.505
Neck dissection	0.734 [0.591–0.912]	0.005
Surgery for tumors of the oral cavity	0.814 [0.653–1.013]	0.065
Parotidectomy	0.588 [0.449–0.769]	<0.001
Surgery for tumors of the submandibular gland	0.323 [0.116–0.898]	0.030
Cutaneous tumors of the head and neck	0.544 [0.294–1.006]	0.052
Thyroidectomy	0.501 [0.391–0.642]	<0.001
Parathyroidectomy	0.701 [0.490–1.004]	0.053
Pharynx tumors	1.437 [0.848–2.435]	0.178

TABLE 4 (Continued)

Variable	Major morbidity	
	Adjusted odds ratio	*p* Value
Concurrent tracheotomy	1.815 [1.539–2.142]	<0.001
Surgical indication		
Benign	Reference	
Malignant	2.431 [1.995–2.961]	<0.001
Wound classification		
Clean	Reference	
Clean-contaminated	1.544 [1.334–1.787]	<0.001
Contaminated	2.655 [1.870–3.770]	<0.001
Dirty/infected	4.398 [2.476–7.811]	<0.001

Note: Only cases with complete data on all covariates were included ($n = 112,298$).

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index; COPD, chronic obstructive pulmonary disease.

significantly associated with major morbidity in the regression analyses.

Regression analyses for secondary outcomes demonstrated Black race to be associated with the development of noninfectious complications (OR: 1.229, 95% CI: 1.017–1.486) (Table 5). Conversely, Black patients had lower odds of developing infectious complications compared to White patients (OR: 0.788, 95% CI: 0.675–0.921). Similarly, Hispanic and Asian patients had reduced odds of requiring unplanned reoperation.

Subgroup regression analyses by procedure type demonstrated lower odds of developing major morbidity among Hispanic patients undergoing surgery for tumors of the oral cavity (OR: 0.486, 95% CI: 0.245–0.962) (Table 6). Additionally, Hispanic patients undergoing neck dissection had reduced odds of requiring unplanned readmission (OR: 0.602, 95% CI: 0.370–0.982). In contrast, Black patients undergoing thyroidectomy had increased odds of requiring unplanned readmission (OR: 1.336, 95% CI: 1.080–1.654), while those undergoing laryngectomy had increased odds of requiring unplanned reoperation (OR: 1.851, 95% CI: 1.167–2.938). Detailed subgroup analyses are documented in the Supplementary Appendix for the following surgical procedures: laryngectomy (Supporting Information S1: Table S2), neck dissection (Supporting Information S1: Table S3), surgery for tumors of the oral cavity (Supporting Information S1: Table S4), parotidectomy (Supporting Information S1: Table S5), thyroidectomy (Supporting Information S1: Table S6), and parathyroidectomy (Supporting Information S1: Table S7).

DISCUSSION

The global burden of head and neck tumors across ethnicities has evolved rapidly.[16] Studies conducted across the United States have demonstrated a rise in the incidence of head and neck cancers among African American and Hispanic patients, often with advanced stages of disease and poorer outcomes.[17,18] Racial disparities have been well documented across various cancers, leading to worsening treatment outcomes.[19,20] This study utilized an international multi-institutional database to assess racial disparities in comorbidities and postoperative outcomes of patients undergoing head and neck oncologic surgeries. In this study, race was not found to be associated with a greater risk of major morbidity. Race was, however, associated with substantial comorbidities, which were associated with a significantly increased risk of major morbidity.

Our results suggest that Black or African American patients are significantly more likely to suffer from preoperative comorbidities than White patients. These included hypertension, diabetes mellitus, dyspnea, and preoperative anemia. Conversely, Asian patients were more likely to suffer from diabetes mellitus and preoperative anemia, while Hispanic patients were more likely to suffer from diabetes mellitus. These findings are congruent with previous literature which has found African American race to be associated with a greater likelihood of comorbidities.[20] These discrepancies across racioethnic groups may be explained by the healthy immigrant theory. This hypothesis is based on the notion that the healthiest and strongest members of a population migrate.[21] These migrants bring with them their superior health and other advantages.[21] Additionally, consumption practices across these ethnicities differ, leading to lower frequencies of smoking and increased consumption of high-fiber diets among Hispanics.[22,23] Lower prevalence of risk factors such as diet and smoking may play a protective role, leading to lower rates of comorbidities in these patients. However, further research is warranted to validate these hypotheses.

This study also demonstrated that Black and Hispanic racioethnic groups were associated with higher BMI. Although our results demonstrated underweight patients to be at greater risk of major morbidity, the constellation of hypertension, diabetes mellitus, and increased BMI characterize the modified version of the US National Cholesterol Education Program Adult Treatment Panel III criterion for

TABLE 5 Multivariable regression model for effects of racioethnic status on different outcomes.

Variable	Adjusted odds ratio	*p* Value
Overall morbidity		
White	Reference	
Hispanic	0.952 [0.817–1.109]	0.526
Black	1.015 [0.899–1.147]	0.806
Asian	1.110 [0.954–1.291]	0.178
Infectious complications		
White	Reference	
Hispanic	0.902 [0.749–1.086]	0.278
Black	0.788 [0.675–0.921]	0.003
Asian	1.089 [0.908–1.306]	0.360
Noninfectious complications		
White	Reference	
Hispanic	0.972 [0.743–1.272]	0.838
Black	1.229 [1.017–1.486]	0.033
Asian	1.097 [0.829–1.452]	0.517
Unplanned readmission		
White	Reference	
Hispanic	1.011 [0.846–1.208]	0.906
Black	1.161 [0.995–1.354]	0.058
Asian	1.072 [0.889–1.291]	0.466
Unplanned reoperation		
White	Reference	
Hispanic	0.768 [0.639–0.922]	0.005
Black	1.088 [0.949–1.248]	0.226
Asian	0.768 [0.636–0.928]	0.006

Note: Only cases with complete data on all covariates were included (n = 61,318 for unplanned readmission, 112,295 for unplanned reoperation, and 112,298 for all other outcomes); regression adjusted for gender, age, body mass index, diabetes mellitus, smoking, hypertension, chronic steroid use, dyspnea, chronic obstructive pulmonary disease, preoperative anemia, operative time, concurrent tracheotomy, surgical indication, American Society of Anesthesiologists physical status, and wound classification.

metabolic syndrome (MetS).[24,25] MetS increases postoperative morbidity, with studies showing a significant increase in the risk of postoperative cardiovascular and cerebrovascular events.[24] Similarly, a study assessing the impact of MetS in microvascular head and neck surgery found that patients suffering from MetS had significantly higher rates of wound site infection, sepsis, and septic shock.[26]

Though the Black race was associated with a greater risk of noninfectious postoperative complications in our study, our results suggest that African Americans are associated with a lower risk of infectious complications. Additionally, we observed that White patients were more likely to have clean-contaminated wounds when compared to Black patients. This could potentially be attributed to White patients undergoing more complex oncologic surgeries, as observed in our univariate analyses. However, adjusting for surgical procedure and indication during regression analyses revealed the same association. This apparent paradox may be explained by a more robust inflammatory response among African Americans. Studies have postulated that evolution over millennia and adaptation to endemic diseases have resulted in the development of innate immunity in this population.[27] Thus, this complex genetic interplay of innate immunity may be attributed to the lower infectious complications among Black patients, although further research is necessary to substantiate this assumption.

We also acknowledge that there may be additional factors beyond the scope of our study influencing certain outcomes. Notably, the ACS-NSQIP database does not include socioeconomic status data, preventing a direct exploration of its impact. Previous research suggests that disparities in healthcare access and socioeconomic differences might contribute to varying outcomes. For instance, literature has elucidated that Black neighborhoods lack satisfactory healthcare facilities.[28] Reduced access to specialist care and relevant diagnostic tests may lead to delays in diagnosis and subsequent management.[19] Inadequate preoperative workup or optimization of medications can potentially exacerbate underlying disease, thereby leading to unsatisfactory noninfectious postoperative outcomes in persons with pre-existing comorbidities. Unfortunately, the ACS-NSQIP does not capture any indicators for socioeconomic status, necessitating further research in this area.

Additionally, we must also acknowledge the presence of multiple confounders among the factors evaluated for individual tumors. These factors include ASA classification, comorbidities, and surgical indication (Supporting Information S1: Tables S2-S7). Literature has demonstrated that worsening ASA classification, comorbidities, and surgical indications all lead to poorer outcomes, as demonstrated in our results.[20] Furthermore, multiple races are associated with such factors, thus further increasing the risk of negative outcomes.[20] As such, during our final analysis we have controlled for confounders based on clinical relevance to establish any potential relationships between race and surgical outcomes following procedures for head and neck tumors. Despite this, it is critical to note that these factors are worse due to a myriad of reasons across multiple racioethnic groups, and thus it is critical to establish the potential reasons for their worsening, and effective interventions to allow for their improvement.

Notably, surgical subgroup analysis revealed that African Americans undergoing thyroidectomy and laryngectomy were at greater risk of unplanned readmission and unplanned reoperation, respectively. These findings are consistent with other studies, which have demonstrated race to impact outcomes of both thyroidectomy and laryngectomy.[20,29] These results may be explained by potential variations in head and neck anatomy across races. Studies have shown race to be a determinant of the head and neck anatomy of a variety of organs, including both the thyroid and the larynx.[30–32] This

TABLE 6 Multivariable regression model for postoperative major morbidity, unplanned readmission, and unplanned reoperation by racioethnic group.

	Major morbidity		Unplanned readmission		Unplanned reoperation	
Surgery	**Adjusted odds ratio**	***p* Value**	**Adjusted odds ratio**	***p* Value**	**Adjusted odds ratio**	***p* Value**
Laryngectomy						
White	Reference		Reference		Reference	
Hispanic	0.890 [0.362–2.188]	0.799	1.206 [0.415–3.507]	0.731	1.189 [0.475–2.976]	0.711
Black	1.263 [0.806–1.979]	0.307	0.958 [0.465–1.975]	0.908	1.851 [1.167–2.938]	0.009
Asian	1.167 [0.480–2.840]	0.733	0.986 [0.292–3.335]	0.982	1.492 [0.582–3.823]	0.404
Neck dissection						
White	Reference		Reference		Reference	
Hispanic	0.763 [0.466–1.248]	0.281	0.602 [0.370–0.982]	0.042	0.734 [0.471–1.143]	0.171
Black	1.103 [0.780–1.559]	0.580	1.034 [0.709–1.508]	0.863	1.058 [0.762–1.470]	0.735
Asian	1.301 [0.814–2.080]	0.272	0.779 [0.461–1.315]	0.350	0.669 [0.395–1.133]	0.135
Surgery for tumors of the oral cavity						
White	Reference		Reference		Reference	
Hispanic	0.486 [0.245–0.962]	0.038	0.908 [0.467–1.764]	0.776	0.731 [0.407–1.314]	0.295
Black	1.002 [0.688–1.460]	0.990	0.937 [0.546–1.608]	0.813	0.872 [0.585–1.297]	0.498
Asian	0.810 [0.497–1.320]	0.397	1.266 [0.765–2.096]	0.359	0.714 [0.432–1.180]	0.188
Parotidectomy						
White	Reference		Reference		Reference	
Hispanic	0.580 [0.223–1.509]	0.264	1.799 [0.917–3.532]	0.088	0.506 [0.204–1.256]	0.142
Black	0.852 [0.419–1.733]	0.658	0.783 [0.355–1.730]	0.546	0.900 [0.489–1.657]	0.735
Asian	1.000 [0.451–2.218]	1.000	0.759 [0.302–1.907]	0.558	0.670 [0.308–1.459]	0.313
Thyroidectomy						
White	Reference		Reference		Reference	
Hispanic	1.009 [0.724–1.407]	0.958	1.178 [0.942–1.474]	0.152	0.824 [0.645–1.053]	0.121
Black	1.235 [0.932–1.636]	0.141	1.336 [1.080–1.654]	0.008	1.074 [0.868–1.328]	0.511
Asian	1.039 [0.733–1.471]	0.830	1.165 [0.919–1.478]	0.208	0.834 [0.651–1.067]	0.149
Parathyroidectomy						
White	Reference		Reference		Reference	
Hispanic	1.226 [0.484–3.106]	0.667	0.552 [0.220–1.385]	0.205	0.668 [0.270–1.652]	0.382
Black	0.925 [0.500–1.709]	0.802	1.236 [0.789–1.986]	0.356	0.939 [0.573–1.536]	0.801
Asian	1.064 [0.253–4.472]	0.932	0.222 [0.030–1.619]	0.138	0.539 [0.131–2.210]	0.391

Note: Regression adjusted for gender, age, body mass index, diabetes mellitus, smoking, hypertension, chronic steroid use, dyspnea, chronic obstructive pulmonary disease, preoperative anemia, operative time, concurrent tracheotomy, surgical indication, American Society of Anesthesiologists physical status, and wound classification.

may lead to difficulties in conducting procedures, which can then manifest as postoperative outcomes, including unplanned readmission and unplanned reoperation. Thus, variations in anatomy may heighten the risk of these complications among African Americans, although we could neither directly explore these variations in the current study nor find relevant literature elucidating anatomic variations among African American patients.

The present study has several implications. This study revealed that African Americans are at risk of many comorbidities, which may, in turn, manifest as increased postoperative complications. Recent literature has advocated for a robust referral system and a shift toward centralizing care of oncology patients.[33,34] Thus, it is imperative that access to primary health care is improved among Black communities to enable early recognition and control of

comorbidities. Furthermore, improvement of insurance access is needed to allow for effective surgical intervention as indicated. Existing literature has highlighted the positive impact of Medicaid expansion on patient outcomes, specifically noting a higher proportion of both Black and White patients presenting with earlier-stage non-head and neck cancers in states that have expanded Medicaid. However, it is concerning to note that the proportion of Black patients remained disproportionately higher in non-expansion states, thereby exacerbating the pre-existing racial disparities seen on a national level.[35] To rectify this situation and promote equity in healthcare, it is essential to implement measures that facilitate equitable improvements in insurance access. By doing so, timely intervention can be ensured, allowing for adequate preoperative workup and subsequent mitigation of preventable postoperative complications. This will enable patients, regardless of their racial background, to receive the necessary care and support required for optimal surgical outcomes. Lastly, further research is imperative to comprehend the impact of anatomical variation on surgical outcomes. Literature has demonstrated that racioethnic differences greatly impact treatment allocation and delivery across different races.[17] Thus, it is critical that a proper understanding of such differences at an anatomical level is implemented to optimize surgical techniques and to alleviate postoperative morbidity.

This study has multiple limitations which must be considered when interpreting our results. First, the analyses were restricted to variables captured by the NSQIP database, and some variables influencing postoperative outcomes could not be assessed. For example, treatment adherence and medication dependence were not explored, although it is likely that poorly controlled disease would worsen postoperative outcomes. Second, the retrospective design of this study increases the likelihood of unmeasured confounders, missing data, and coding errors. In addition, this design only allows us to establish associations, not causations, between racial disparities and postoperative outcomes. Third, our findings are likely influenced by the demographic makeup of the predominant data sources in the ACS-NSQIP, which may introduce a potential bias in generalizability. Lastly, racial disparities may lead to differing oncological metrics such as greater tumor burden, advanced preoperative staging, and poorer disease prognosis. Such oncological metrics are not documented in the NSQIP database, and thus we are unable to account for their impact on postoperative outcomes.

CONCLUSION

African Americans undergoing head and neck oncologic surgery are more likely to suffer from comorbidities, which are, in turn, associated with major morbidity. Considering this, there is a need to enact measures to improve access to healthcare and enable proper disease control. Additionally, further research is indicated to establish causality and examine the impact of anatomical characteristics on the development of these critical outcomes.

AUTHOR CONTRIBUTIONS

Usama Waqar conceptualized the study. Usama Waqar, Haissan Iftikhar, and Syed A. Abbas designed the study. Usama Waqar and Ayesha N. Hameed drafted the protocol. Usama Waqar and Muhammad Hamza performed statistical analyses. Usama Waqar, Aahan Arif, Ayesha N. Hameed, and Syeda M. A. Zaidi drafted the initial version of the manuscript which was reviewed and edited by all authors. All authors approved the final version of the manuscript to be published.

ACKNOWLEDGMENTS

American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) and the hospitals participating in the ACS-NSQIP are the sources of the data used herein; they have not verified and are not responsible for the statistical validity of the data analysis or the conclusions derived by the authors.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data were obtained through the ACS-NSQIP database and are used with the permission of The American College of Surgeons.

ETHICS STATEMENT

This study was conducted following exemption from the Ethics Review Committee at the Aga Khan University, Karachi, Pakistan (ERC# 2022-7075-20400).

ORCID

Aahan Arif http://orcid.org/0000-0002-1037-6090
Haissan Iftikhar http://orcid.org/0000-0003-3266-4015

REFERENCES

1. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2020. *CA Cancer J Clin*. 2020;70:7-30.
2. Dort JC, Farwell DG, Findlay M, et al. Optimal perioperative care in major head and neck cancer surgery with free flap reconstruction: a consensus review and recommendations from the enhanced recovery after surgery society. *JAMA Otolaryngol Head Neck Surg*. 2017;143:292-303.
3. Cramer JD, Patel UA, Samant S, Smith SS. Postoperative complications in elderly patients undergoing head and neck surgery: opportunities for quality improvement. *Otolaryngol Head Neck Surg*. 2016;154:518-526.
4. Suh JD, Sercarz JA, Abemayor E, et al. Analysis of outcome and complications in 400 cases of microvascular head and neck reconstruction. *Arch Otolaryngol Head Neck Surg*. 2004;130:962-966.
5. Patient Protection and Affordable Care Act. PL 111-148 and Healthcare and Education Reconciliation Act of 2010 PL 111-152. US Government Printing Office; 2010. Accessed January 6, 2019. https://wwwcongress gov/111/plaws/publ148/PLAW-111publ148pdf
6. Kelly RL. Health Equity and Accountability Act of 2022. Congress.gov; 2022.
7. Graboyes EM, Hughes-Halbert C. Delivering timely head and neck cancer care to an underserved urban population-better late than

never, but never late is better. *JAMA Otolaryngol Head Neck Surg*. 2019;145:1010-1011.
8. Osazuwa-Peters N, Adjei Boakye E, Chen BY, Tobo BB, Varvares MA. Association between head and neck squamous cell carcinoma survival, smoking at diagnosis, and marital status. *JAMA Otolaryngol Head Neck Surg*. 2018;144:43-50.
9. Zandberg DP, Liu S, Goloubeva O, et al. Oropharyngeal cancer as a driver of racial outcome disparities in squamous cell carcinoma of the head and neck: 10-year experience at the University of Maryland Greenebaum Cancer Center. *Head Neck*. 2016;38:564-572.
10. Goodwin WJ, Thomas GR, Parker DF, et al. Unequal burden of head and neck cancer in the United States. *Head Neck*. 2008;30:358-371.
11. Lee K, Strauss M. Head and neck cancer in blacks. *J Natl Med Assoc*. 1994;86:530-534.
12. Gourin CG, Podolsky RH. Racial disparities in patients with head and neck squamous cell carcinoma. *Laryngoscope*. 2006;116:1093-1106.
13. Jassal JS, Cramer JD. Explaining racial disparities in surgically treated head and neck cancer. *Laryngoscope*. 2021;131:1053-1059.
14. Sellers MM, Merkow RP, Halverson A, et al. Validation of new readmission data in the American College of Surgeons National Surgical Quality Improvement Program. *J Am Coll Surg*. 2013;216:420-427.
15. World Health Organization. *Haemoglobin Concentrations for the Diagnosis of Anaemia and Assessment of Severity. Vitamin and Mineral Nutrition Information System (VMNIS)[Internet]*. World Health Organization; 2011.
16. Aupérin A. Epidemiology of head and neck cancers: an update. *Curr Opin Oncol*. 2020;32:178-186.
17. Mazul AL, Chidambaram S, Zevallos JP, Massa ST. Disparities in head and neck cancer incidence and trends by race/ethnicity and sex. *Head Neck*. 2023;45:75-84.
18. Zhang C, Zhang C, Wang Q, Li Z, Lin J, Wang H. Differences in stage of cancer at diagnosis, treatment, and survival by race and ethnicity among leading cancer types. *JAMA Netw Open*. 2020;3:e202950.
19. Du XL, Fang S, Coker AL, et al. Racial disparity and socioeconomic status in association with survival in older men with local/regional stage prostate carcinoma: findings from a large community-based cohort. *Cancer*. 2006;106:1276-1285.
20. Beck AC, Sugg SL, Weigel RJ, Belding-Schmitt M, Howe JR, Lal G. Racial disparities in comorbid conditions among patients undergoing thyroidectomy for Graves' disease: an ACS-NSQIP analysis. *Am J Surg*. 2021;221:106-110.
21. Franzini L, Ribble JC, Keddie AM. Understanding the Hispanic paradox. *Ethn Dis*. 2001;11:496-518.
22. Rogers RG, Crank J. Ethnic differences in smoking patterns: findings from NHIS. *Public Health Rep (Washington, D.C.: 1974)*. 1988;103:387-393.
23. Jones LA, Gonzalez R, Pillow PC, et al. Dietary fiber, Hispanics, and breast cancer risk? *Ann NY Acad Sci*. 1997;837:524-536.
24. Waqar U, Hussain MH, Ahmed W, et al. Association of metabolic syndrome with stroke, myocardial infarction, and other postoperative complications following carotid endarterectomy: a multicenter, retrospective cohort study. *Ann Vasc Surg*. 2023;97:329-339.
25. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive summary of the third report of The National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). *JAMA*. 2001;285:2486-2497.
26. Panayi AC, Haug V, Kauke-Navarro M, Diehm YF, Pomahac B. The impact of metabolic syndrome on microvascular head and neck reconstruction: an ACS-NSQIP data analysis. *J Plast Reconstruct Aesthet Surg*. 2022;75:1360-1371.
27. Gong Z, Quan L, Yao S, et al. Innate immunity pathways and breast cancer risk in African American and European-American women in the Women's Circle of Health Study (WCHS). *PLoS One*. 2013;8:e72619.
28. Bach PB, Pham HH, Schrag D, Tate RC, Hargraves JL. Primary care physicians who treat blacks and whites. *N Engl J Med*. 2004;351:575-584.
29. Helman SN, Brant JA, Moubayed SP, Newman JG, Cannady SB, Chai RL. Predictors of length of stay, reoperation, and readmission following total laryngectomy. *Laryngoscope*. 2017;127:1339-1344.
30. Toni R, Della Casa C, Castorina S, Roti E, Ceda G, Valenti G. A meta-analysis of inferior thyroid artery variations in different human ethnic groups and their clinical implications. *Ann Anat*. 2005;187:371-385.
31. Wu J, Ebrahim A. Ethnic disparities for thyroid surgery. *ANZ J Surg*. 2020;90:2527-2531.
32. Cha YH, Moon SY, Jehoon O, Tansatit T, Yang HM. Anatomy of the external branch of the superior laryngeal nerve in Asian population. *Sci Rep*. 2017;7:14952.
33. Stitzenberg KB, Meropol NJ. Trends in centralization of cancer surgery. *Ann Surg Oncol*. 2010;17:2824-2831.
34. Al-Refaie WB, Muluneh B, Zhong W, et al. Who receives their complex cancer surgery at low-volume hospitals? *J Am Coll Surg*. 2012;214:81-87.
35. Snyder RA, Hu CY, DiBrito SR, Chang GJ. Association of medicaid expansion with racial disparities in cancer stage at presentation. *Cancer*. 2022;128:3340-3351.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Waqar U, Arif A, Hameed AN, et al. Racioethnic disparities in comorbidities and outcomes following head and neck oncologic surgery. *World J Otorhinolaryngol Head Neck Surg*. 2025;11:74-85. doi:10.1002/wjo2.178