

# Investigating Racial and Socioeconomic Disparities in Acute Radiation-Related Toxicities among Patients Diagnosed with Head and Neck Cancer

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Medical Student Research Symposium

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## BACKGROUND

- Radiation therapy (RT) for head and neck cancer (HNC) is associated with toxicities such as mucositis and xerostomia
- HNC survival between African American (AA) & Caucasian (C) patients are increasing over time
- Disparities in quality-of-life (QoL) outcomes have also been identified between AA & C patients with HNC
- Socioeconomic status plays a role in decreased access to and utilization of radiation therapy
- However, there is limited data on racial and socioeconomic disparities in radiation-related toxicities for patients with HNC

## STUDY OBJECTIVE

We aim to investigate if race and socioeconomic status are associated with increased rates of treatment-related toxicity, which could result in escalated clinical interventions and decreased QoL.

## METHODS

- Retrospective chart review: 463 HNC patients treated with RT at JHH from 2015-2019
- 12 parameters for acute treatment-related toxicity and pain assessments were collected at point of care:
  - 1 patient-reported outcome: pain (LASA scale)
  - 8 provider-scored per CTCAE: mucositis, aspiration, dehydration, dermatitis, fatigue, nausea, xerostomia, anorexia
  - 3 binary toxicity parameters: hospitalizations/ED visits, nasogastric (NG) tube placement and PEG tube placement (all within 3 months of radiotherapy start)
- Median household income (MHI) was extrapolated from US census data based on patient zip codes
- Demographic and clinical data extracted from EMR
  - Racial demographics reported 64 African American, 19 Asian, 364 Caucasian, and 16 Other Race patients.
  - Asian and Other Race patients were ultimately excluded from analysis due to small sample size
- Univariate analysis was used to compare toxicity parameters between African American and Caucasian patients
- Multivariate analysis was used in analysis of MHI and to better understand toxicity outcomes that were significant on univariate analysis
  - Logistic regression used to analyze binary outcomes; ANOVA (Type II) used to analyze continuous outcomes (with combination of continuous & categorical predictor variables)

## RESULTS

	Mean Pain Avg Score	Mean Mucositis Avg Score	Mean Dermatitis Avg Score	PEG placed %
	(n)	(n)	(n)	(n)
AA	2.18 (64)	1.55 (64)	0.48 (41)	31.9 (47)
C	1.62 (364)	1.72 (364)	0.73 (231)	17.3 (237)
p-value	0.0068*	0.035*	0.0001*	0.021*

**Table 1. Univariate analysis comparing toxicity parameters between AA & C patients.** Only statistically significant results were shown. Higher patient-reported pain scores and higher rates of PEG tube placement were reported in AA patient. Higher mucositis and dermatitis scores (provider scored per CTCAE) were reported in C patients.

	Estimate	P value
(Intercept)	3.22	0.5006
T-stage	0.795	0.0158*
Cancer type	3.27	0.0008*
KPS	-0.0614	0.0518
Mucositis Avg	-1.88	0.0784
Dermatitis Avg	3.66	0.0058*

**Table 2. Multivariate analysis to understand risk factors for PEG tube placement during RT.** Only statistically significant results were shown using logistic regression for binary outcomes.

	Sum Sq	P value
Age	4.07	0.0002*
Median Household Income	0.757	0.0967
CCI	2.243	0.0047*
KPS	0.77	0.0940

**Table 3. Multivariate analysis for average patient-reported pain scores.** Only statistically significant results were shown using ANOVA (Type II) analysis.

	Sum	P value
GTV	0.1707	0.0302*
KPS	0.1918	0.0218*
PEG placed %	0.1303	0.0578

**Table 4. Multivariate analysis for average mucositis scores.** Only statistically significant results were shown using ANOVA (Type II) analysis.

	Sum	P value
Race	0.7414	0.0460*
T-stage	0.5441	0.0154*
KPS	0.3949	0.0383*
PEG placed %	0.3642	0.0466*

**Table 5. Multivariate analysis for average dermatitis scores.** Only statistically significant results were shown using ANOVA (Type II) analysis.

	Median household Income	KPS~	T-Stage
AA	58838	86.59	2.79
C	77634	92.02	2.25
p-value	0.00001*	0.0013*	0.0007*

~caveat: KPS is measured from normal functioning (100) to deceased (0) in ten-point increments.

**Table 6. Student's t-tests comparing Median Household Income, KPS, and T-stage between AA & C patients.** AA patients had a statistically significantly lower median household income, lower KPS~, and higher T-stage when compared with C patients.

## CONCLUSIONS

- Pain, mucositis, dermatitis, and PEG placement between AA and C patients were significant on univariate analysis. However, on multivariate analysis, race was only statistically significant in dermatitis, with C patients receiving grades of higher severity
- KPS and T-stage commonly appeared as significant on multivariate analysis. There appear to be trends of lower KPS~ and higher T-stage in AA vs. C patients.
- We also noticed a trend where patients with lower median household income (MHI) reported higher pain scores during RT. AA patients had statistically significantly lower MHI.

## LIMITATIONS

- We recognize that racial and socioeconomic disparities are deeply complex, with many interactions amongst variables. Future studies would benefit from greater sample size, prospective study, and more sophisticated statistical modeling.

## IMPLICATIONS

- Further investigation is warranted to clarify the role of racial and socioeconomic disparities in the experience of patients receiving radiation therapy for head and neck cancer.