

# Socioeconomic Factors and Health Disparities in Patients with Pituitary Apoplexy

Amanda Bingaman BA, MS<sup>1</sup>; India Shelley BS<sup>1</sup>; Gabriel Levis BS<sup>1</sup>; Shiv Patil BS<sup>1</sup>; Roger Murayi MD<sup>1</sup>; David Bray MD<sup>1</sup>; James J. Evans MD<sup>1</sup>

<sup>1</sup>Department of Neurological Surgery, Thomas Jefferson University Hospital

## INTRODUCTION

- Pituitary apoplexy is a rare but life-threatening event estimated to occur in around 2-12% of pituitary adenomas
- Despite research looking at relevant medical comorbidities and possible risk factors, there is a lack of data on the role of socioeconomic status (SES) and other health disparities in the development of apoplexy
- A better understanding of the link between social determinants of health (SDOH) and apoplexy is critical to establishing more equitable access to care

### AIM:

To investigate if factors such as age, sex, race, insurance, and SES influence health outcomes seen in patients with pituitary adenoma that presented with pituitary apoplexy.

## METHODS

Retrospective chart review of patients with pituitary adenomas that initially presented with pituitary apoplexy and underwent surgery at TJUH

### Predictor variables:

- Area deprivation index (ADI)
- Median household income
- Age
- Sex
- Race
- Insurance status

### Outcome variables:

- Symptom duration, including vision loss
- Length of stay (LOS)
- 30-day readmission rate
- Tumor volume
- Amount of residual disease
- Recurrence rate
- Postoperative endocrine status

- Area deprivation index (ADI) is a validated and widely accepted measure of SES based on neighborhood of residence, both at the state and national level
- In our study, ADI was calculated using the patient's address as listed on the electronic medical record (EMR)
- Data on median household income was derived from the U.S. census website using the patient's zip code of primary residence from the EMR
- Variables were first assessed for normality, and linear regression was used to evaluate correlations between continuous variables (age, BMI, ADI, median household income) and outcome variables of interest
- For categorical variables (sex, race, insurance status), the chi square test of independence was used

## RESULTS

- 61 patients (42M, 19F) with pituitary adenoma and radiographic evidence of pituitary apoplexy were included
- ADI (**Table 1**):
  - Directly correlated with tumor volume (p=0.016) and postoperative diabetes insipidus (p=0.021)
  - Inversely correlated with postoperative thyroid insufficiency (p=0.01)
- Median household income (**Table 2**):
  - Directly correlated with vision loss for greater than 24 hours at presentation (p=0.033) and preoperative DDAVP use (0.004)
  - Inversely correlated with tumor volume (p=0.023) and postoperative SIADH (p=0.025)
  - Trend toward significance suggesting a direct correlation with postoperative thyroid insufficiency (p=0.054)
- Age:
  - Directly correlated with total LOS (p=0.004), postoperative LOS (p=0.006), vision loss for greater than 24 hours at presentation (p=0.033), and postoperative SIADH (p=0.033)
  - Inversely correlated with presenting symptom of headache (0.012) and presence of functioning/secretory tumor (p=0.005)
- No significant findings were found for the predictor variables of race and insurance status, including the presence of insurance and private insurance

**Table 1.** Correlations between ADI and patient outcomes.

	Estimate (β)	p value
Total Length of Stay	0.18	0.81
Readmission	3.21	0.73
Vision Loss > 24 h at Presentation	-11.25	0.13
<b>Tumor Volume</b>	<b>0.53</b>	<b>0.016</b>
Functioning / Secretory Tumor	1.62	0.87
Residual Disease	-12.69	0.11
Pre-op DDAVP	11.07	0.57
<b>Post-op Diabetes Insipidus</b>	<b>24.39</b>	<b>0.021</b>
Post-op SIADH	7.33	0.5
Post-op Hypocortisolism	4.08	0.59
<b>Post-op Thyroid Insufficiency</b>	<b>-18.40</b>	<b>0.01</b>

**Table 2.** Correlations between median household income and patient outcomes.

	Estimate (β)	p value
Total Length of Stay	-873.7	0.41
Readmission	3211	0.80
<b>Vision Loss &gt; 24 h at Presentation</b>	<b>21354</b>	<b>0.034</b>
<b>Tumor Volume</b>	<b>-819.2</b>	<b>0.023</b>
Functioning / Secretory Tumor	-524.3	0.97
Residual Disease	14725	0.25
<b>Pre-op DDAVP</b>	<b>61581</b>	<b>0.004</b>
Post-op Diabetes Insipidus	-4263	0.78
<b>Post-op SIADH</b>	<b>-33746</b>	<b>0.025</b>
Post-op Hypocortisolism	6915	0.51
<b>Post-op Thyroid Insufficiency</b>	<b>19504</b>	<b>0.054</b>

## DISCUSSION

- At our institution, lower SES, as indicated by a higher ADI, was associated with higher rates of postoperative endocrine dysfunction, including diabetes insipidus and thyroid insufficiency.
- Patients with a higher median household income were more likely to have vision loss for greater than 24 hours at presentation and pre-operative DDAVP. A lower median household income was associated with higher rates of post-operative SIADH.
- Tumor volume was directly correlated with ADI and inversely correlated with median household income, suggesting that patients with lower SES were more likely to have larger tumors.
- Tumor volume was the only variable that correlated with lower SES as defined by both ADI and income data, which may reflect differences between ADI and income as measures of SES.
- Our findings help highlight potential disparities that may exist in apoplexy outcomes as a function of SES.

## Contact

Amanda Bingaman  
Lewis Katz School of Medicine at Temple University  
amandabingaman@temple.edu  
(440)-382-2563

## References

- Jahangiri A, Clark AJ, Han SJ, Kunwar S, Blevins LS Jr, Aghi MK. Socioeconomic factors associated with pituitary apoplexy. *J Neurosurg.* 2013;119(6):1432-1436. doi:10.3171/2013.6.JNS122323
- Kind AJH, Buckingham W. Making Neighborhood Disadvantage Metrics Accessible: The Neighborhood Atlas. *New England Journal of Medicine.* 2018. 378: 2456-2458. DOI: 10.1056/NEJMp1802313. PMID: PMC6051533. AND University of Wisconsin School of Medicine Public Health. 2024 Area Deprivation Index v4.0. <https://www.neighborhoodatlas.medicine.wisc.edu/>
- Möller-Goede DL, Brändle M, Landau K, Bernays RL, Schmid C. Pituitary apoplexy: re-evaluation of risk factors for bleeding into pituitary adenomas and impact on outcome. *Eur J Endocrinol.* 2011;164(1):37-43. doi:10.1530/EJE-10-0651
- Biagetti B, Sarria-Estrada S, Cordero Asanza E, et al. Risk Factors, Radiological and Clinical Outcomes in Subclinical and Clinical Pituitary Apoplexy. *J Clin Med.* 2022;11(24):7288. Published 2022 Dec 8. doi:10.3390/jcm11247288