Epidemiology of Post-Traumatic Brain Injury-Induced Hypothalamic Pituitary Dysfunction in Arizona AHCCCS Patients

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Introduction

- Traumatic brain injuries (TBIs) are a major public health burden due to the high incidence and potential for long-term impact on patient help. Total combined rates for TBI-related emergency department (ED) visits, hospitalizations and deaths have increased over the past decade[1]. The increasing incidence and simultaneous decreas in deaths due to TBI increases the possibility for post-injury physical, psychological, cognitive, and emotional disorders.
- Endocrine disorders secondary to post-TBI hypopituitarism are potential consequences, as evidenced in publications regarding adult endocrine dysfunction after TBI[1-3].
- However, post-TBI hypopituitarism in children is understudied.
- We present 2797 AHCCCS patients who were diagnosed with one of 40 ICD-9 TBI codes and subsequently diagnosed with one of 116 ICD-9 idiopathic endocrine diagnoses. We determined prevalence, relative risk, odds ratio, attributable risk, and number needed to harm, based on age, race, and gender.

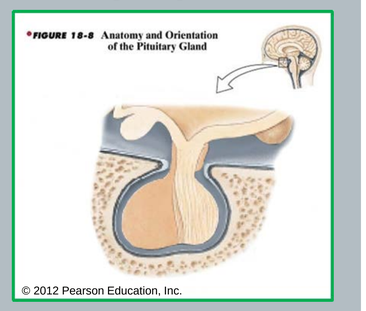

Figure 1. Anatomy and location of the pituitary gland demonstrating its vulnerability to TBI by being located in the sella turcica.

Hypothesis

Pediatric patients who were diagnosed with a TBI were at a higher risk of being diagnosed with a central endocrinopathy than those without a prior diagnosis of TBI.

Methods

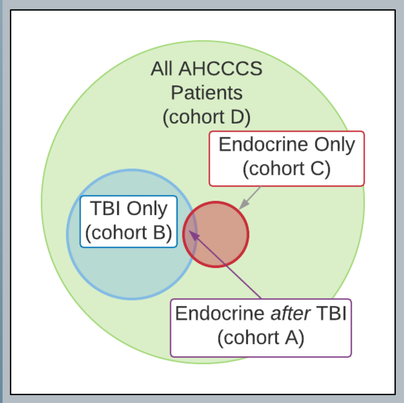

Figure 2. Patient cohorts

- We conducted a retrospective analysis of AHCCCS patients enrolled from 2007-2014.
- Patient cohorts included 4 categories: Patients who were diagnosed with a TBI and subsequently developed new-onset central endocrinopathies (cohort A), only diagnosed with a TBI (cohort B), only diagnosed with a central endocrinopathy (cohort C), or who were diagnosed with neither (cohort D), for each year from 2007-2014.
- From these 4 cohorts, we were able to calculate prevalence, relative risk, odds ratio, attributable risk, and number needed to harm, stratified by on age, race, and gender.

Populations	**Endo +**	**Endo -**
TBI +	Cohort A (n=511)	Cohort B (n=145,413)
TBI -	Cohort C (n=110,311)	Cohort D (n=656,680)

Table 1. Patient Cohorts

References

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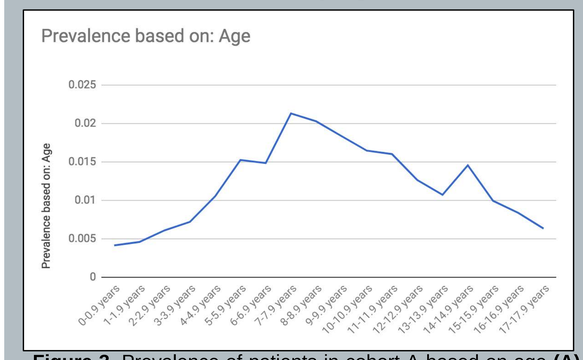
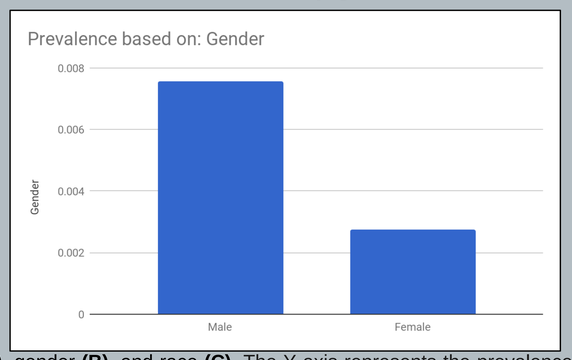
Patient demographics for those with a central endocrinopathy after TBI

A Prevalence stratified by age



B Prevalence stratified by gender



C Prevalence stratified by race

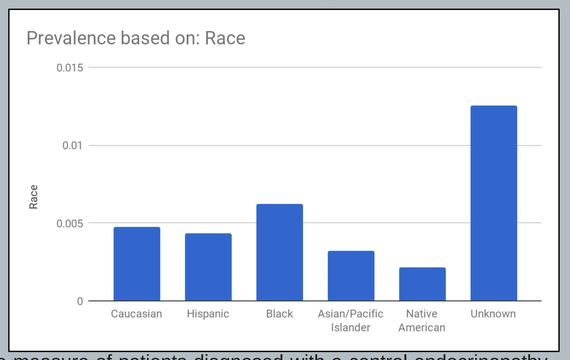
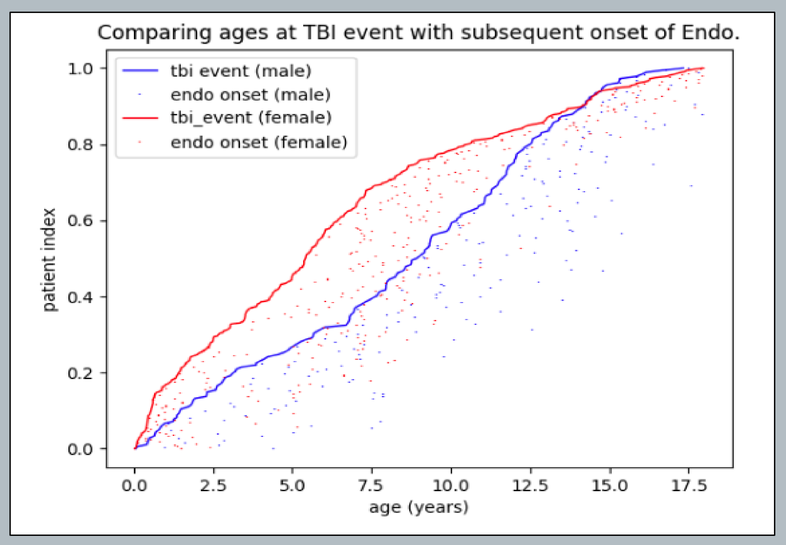


Figure 3. Prevalence of patients in cohort A based on age **(A)**, gender **(B)**, and race **(C).** The Y axis represents the prevalence measure of patients diagnosed with a central endocrinopathy after a TBI.

Onset of central endocrinopathy after TBI

A



B

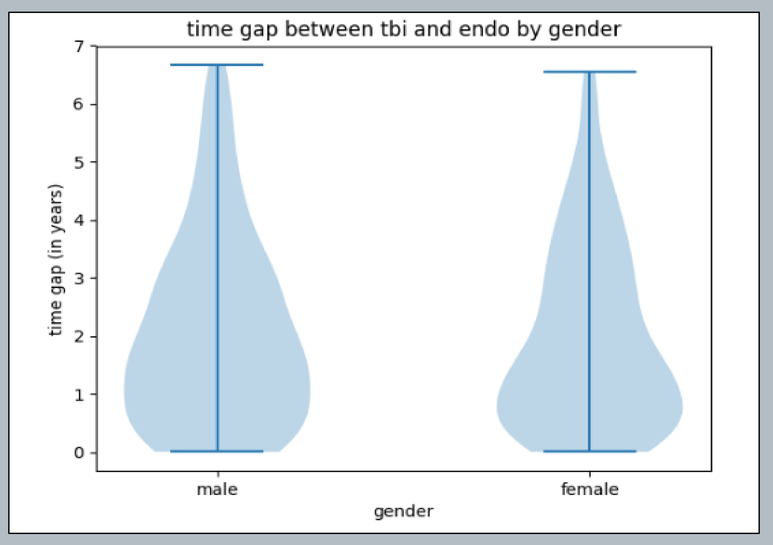


Figure 4. Female TBI victims are more likely to be diagnosed with central endocrinopathies at an earlier age than males with TBIs. **(A)** Patients on Y-axis, age (years) on x-axis, solid lines in red (female) and blue (male) representing age at TBI diagnosis depicting age at each central endocrinopathy diagnosis. **(B)** Quantity of patients on the x-axis for males and females.

C

Measure of Association	**Value**
Relative Risk	6.213
Odds Ratio	6.312
Attributable Risk	0.016
Number Needed to Harm	63.94

Biostatistics

Figure 4C: Epidemiological biostatistics comparing cohorts A, B, C, D. TBI victims were 6-fold higher risk of developing a central endocrinopathy compared with the general population, pediatric AHCCCS patients with a central endocrinopathy had a 6-fold higher odds of a history with TBI than those without a central endocrinopathy, 1.6% of the central endocrinopathy in TBI victims is attributable to the TBI, and the number of patients who need to be exposed to a TBI for 1 patient to develop an endocrinopathy was 63.9.

Conclusions and Future Directions

- This study is the first to determine the epidemiology of new-onset central endocrinopathies after TBI in the pediatric population in the Arizona Medicaid System from 2008-2014.
- We determined that TBI victims were 3.18-times higher risk of developing a central endocrinopathy compared with the general population (CI=0.264).
- We determined pediatric AHCCCS patients with a central endocrinopathy had a 3.2-fold higher odds of a history with TBI than those without a central endocrinopathy (CI=0.266).
- We determined that the number of patients who need to be exposed to a TBI for 1 patient to develop an endocrinopathy was 154.2 (CI=7.11)
- **Patients can present with central, new-onset endocrinopathies days to years after TBI; physicians must be aware of endocrine symptoms after TBI and add TBI-induced central endocrinopathies to their differential diagnosis when treating a patient with a history of TBI.**
- Further prospective studies are needed to better determine correlation between TBI severity and endocrinopathies.