The Association of End-Stage Renal Disease and Thoracic Aortic Aneurysm in the National Inpatient Sample

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BACKGROUND

- The normal size of the thoracic aorta is influenced by age, sex, and BSA. Dilation beyond the aorta’s normal limits can lead to a thoracic aortic aneurysm (TAA) or dissection if left untreated. [1]
- Cardiovascular disease (CVD) is one of the main causes of mortality and morbidity in end-stage renal disease (ESRD) patients. [3]
- Sparse literature exists about the prevalence and relationship between TAA in ESRD patients.
- A 2015 pediatric study found that aortic dilation is associated among children with glomerular ESRD and low BMI z-scores. [4]
- The National Inpatient Sample (NIS) is the largest inpatient database in the U.S. and is excluded from dialysis patients as they would temporarily be on dialysis without record of CDR or ESRD. 0.8% of ESRD patients have thoracic aortic aneurysm as compared to 0.15% of other patients. The NIS statistic is 61,813,914 and p-value is < 0.001.

OBJECTIVES

- To analyze the relationship between ESRD and TAA in patients ages 18 and above in the NIS
- To identify risk factors of TAA in our population and evaluate whether they align with existing literature

METHODS

- Utilized SPSS to randomly sample 25% of cases in NIS Database from 2003 to 2014
- Categorized patients based on diagnoses with TAA, ESRD, and other clinical factors
- Performed a chi-square test of independence and both univariate and multivariate logistic regression analysis on selected variables
- Compared with previous studies to support or refute findings

RESULTS

- Total Number of Cases in NIS Sample 2003-2014 (374,319,839)
- Total number of cases in 25% random sample (99,555,130)
- Dialysis patients with AKI and Non-Dialysis Patients (91,331,190)
- ESRD/Dialysis patients without AKI (2,325,041)
- TAA’s (133,328)
- TAA’s (19,067,861)
- ESRD (135,768,000)
- TAA’s (18,864)
- ESRD (3,205,077)

CONCLUSIONS

- With a p-value of less than 0.001 and a chi-squared statistic of 61,813,914 from the chi-square test analysis, a statistically significant relationship exists between ESRD and TAA.
- ESRD is a significant predictor in univariate (OR: 5.592, CI: 5.507-5.678) and multivariate (OR: 8.013, CI: 7.875-8.153) analyses for the development of TAA.
- Since 86.8% of patients with ESRD and TAA and 21.8% of all cases with TAA also had a thoracic aortic dissection, the NIS is predominately capturing TAA that is associated with acute thoracic disease.
- Analysis not representative of prevalence of and risk factors for chronic stable thoracic aortic disease.
- Hypertension is a strong predictor in univariate and not in multivariate analysis. ESRD may be capturing bulk of risk associated with long standing poorly controlled hypertension.
- Diabetes is a negative predictor of TAA, which aligns with literature [5].

LIMITATIONS AND FUTURE WORK

- Does not include variables like height, weight, and BSA
- Reliance on ICD-9 codes. No records of laboratories or imaging to verify TAA or –
- Selection of cases biased toward acute disease. May lead to misclassification of controls
- Cross-sectional data only
- Run a correlation test on the variables
- Compare difference between ESRD patients on hemodialysis and peritoneal, those on dialysis and those with kidney transplant, and glomerular ESRD and non-glomerular ESRD to better clarify mechanism
- Add socio-economic data as a variable
- Use United States Renal Data System database to evaluate prevalence of chronic stable thoracic aortic disease in patients with ESRD.
- Use LVHN data to conduct a study of ESRD as a risk factor for thoracic aortic disease with ability to more precisely classify patients with ESRD and thoracic aortic aneurysm

REFERENCES


Table 1. Odds Ratio and 95% CI for Selected Variables

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Univariate Analysis OR (95% CI Interval)</th>
<th>Multivariate Analysis OR (95% CI Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 65 and Above</td>
<td>1.317 (1.072–1.627)</td>
<td>1.317 (1.072–1.627)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
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<tr>
<td>White</td>
<td>3.772 (3.657–3.889)</td>
<td>1.452 (1.429–1.475)</td>
</tr>
<tr>
<td>Black</td>
<td>0.480 (0.323–0.657)</td>
<td>1.140 (1.135–1.150)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.496 (0.469–0.524)</td>
<td>0.906 (0.882–0.911)</td>
</tr>
<tr>
<td>Asian</td>
<td>0.802 (0.780–0.822)</td>
<td>1.910 (1.845–1.977)</td>
</tr>
<tr>
<td>Native American</td>
<td>0.546 (0.446–0.669)</td>
<td>1.232 (1.138–1.340)</td>
</tr>
<tr>
<td>Other</td>
<td>0.867 (0.784–0.959)</td>
<td>1.477 (1.425–1.531)</td>
</tr>
<tr>
<td>Female</td>
<td>0.904 (0.904–1.101)</td>
<td>0.641 (0.634–0.648)</td>
</tr>
<tr>
<td>ESRD</td>
<td>5.592 (5.507)</td>
<td>8.013 (7.875–8.153)</td>
</tr>
<tr>
<td>Genetic Syndromes (Marfan, Turner, Ehlers-Danlos, and Loeys-Dietz)</td>
<td>1.339 (1.288–1.622)</td>
<td>2.437 (2.344–2.607)</td>
</tr>
<tr>
<td>Vasculitis (Takayasu Disease and Giant Cell Arteritis)</td>
<td>1.865 (1.167–2.980)</td>
<td>0.012 (0.011–0.013)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>31.623 (30.059–32.618)</td>
<td>1.602 (1.584–1.620)</td>
</tr>
<tr>
<td>Obesity/Overweight</td>
<td>3.756 (2.660–5.859)</td>
<td>1.441 (1.417–1.465)</td>
</tr>
<tr>
<td>Use of Tobacco</td>
<td>2.631 (2.550–2.715)</td>
<td>1.552 (1.534–1.570)</td>
</tr>
<tr>
<td>High Cholesterol</td>
<td>2.087 (2.727–2.889)</td>
<td>1.535 (1.524–1.553)</td>
</tr>
<tr>
<td>Arteriosclerosis</td>
<td>1.542 (1.456–1.632)</td>
<td>1.696 (1.653–1.740)</td>
</tr>
<tr>
<td>Family History of Thoracic Aortic Aneurysm</td>
<td>1.774 (1.381–2.285)</td>
<td>0.903 (0.894–0.912)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.862 (0.837–0.876)</td>
<td>0.669 (0.659–0.676)</td>
</tr>
</tbody>
</table>