Prevalence of Asthma in Multiple Sclerosis: a United States Population-Based Study

Eddie Hill1, Hesham Abboud2, Farren B. S. Briggs3

1. Case Western Reserve University School of Medicine; 2. University Hospitals Cleveland Medical Center; 3. Neuroimmunological Disorders Genome-Evironment Epidemiology (NDGEE) Laboratory, Department of Population and Quantitative Health Sciences, Case Western Reserve University

Objective

To evaluate the age-, gender-, and race-specific prevalence rates of asthma in MS patients compared to non-MS individuals using electronic health record (EHR) information from the IBM® Explorys EPM: Explore database (Explorys).

Methods

• Patients cohorts were built in May 2018 based on combinations of SNOMED-CT diagnoses of “multiple sclerosis” and “asthma” at any point in time, by age, gender, and racial attributes.

• Age- and gender-adjusted prevalence rates were compared using direct standardization and tests for proportions. Prevalence ratios (PRs) and 95% confidence intervals (CI) were calculated.

Results

• In the MS cohort (N=141,880), the prevalence of asthma had a U-shaped distribution, with the greatest burden on the young and the elderly. There was a uniform distribution in the non-MS cohort (N= 56,416,790) (Figure 1).

• The crude prevalence of asthma was 2.48 (95% CI: 2.45, 2.52; p<0.0001) times higher in the MS cohort than the non-MS cohort (16.5% versus 6.7%, respectively) (Table 1).

• After adjusting for age and gender, asthma was 2.97 times more common in MS patients than in the general population (95% CI: 2.96, 2.97) (Figure 1).

• Comparing asthma prevalence among subgroups, the burden of asthma was greater in MS than in non-MS individuals as follows (Table 2): White Americans, PR: 2.48 (2.48,2.48); African Americans, PR: 1.48 (1.47,1.48); All females, PR: 2.65 (2.65,2.66); All males, PR: 3.39 (3.38,3.40).

Discussion

• Asthma prevalence among persons with MS is significantly greater than asthma prevalence in non-MS individuals across age, gender, and racial subpopulations.

• In the MS cohort, the greatest asthma burden occurred among the young and the elderly (>20% prevalence among those < 30 or ≥ 80 years; prevalence range: 15 to 30%).

• The differences in the underlying Th1/Th2 mechanisms contributing to MS onset and asthma onset may support an inverse relationship between the two diseases.

• However, the co-occurrence of MS and asthma is not unexpected, considering both diseases have increasing incidence, increasing prevalence, and overlapping risk factors (including genetic factors, tobacco smoke exposure, vitamin D insufficiency, and obesity). 3-6

• The co-occurrence of MS and asthma may impact daily functioning, quality of life, and prognosis of patients. The results emphasize the need for continued research and need for comorbidity management as part of comprehensive MS care.

References


Figure 1. Prevalence of asthma by age, gender, and MS dx in the total population (A), in White Americans (B), and in African Americans (C).

Table 1. Prevalence of asthma in the total population by MS dx.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Asthma in Total Population</th>
<th>Asthma in MS Cohort</th>
<th>Asthma in non-MS Cohort</th>
<th>Prevalence Ratio (PR)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-15</td>
<td>19.5</td>
<td>6.7</td>
<td>12.9</td>
<td>2.8</td>
<td>(2.8, 2.9)</td>
</tr>
<tr>
<td>16-24</td>
<td>24.8</td>
<td>4.0</td>
<td>20.7</td>
<td>1.2</td>
<td>(1.1, 1.3)</td>
</tr>
<tr>
<td>25-34</td>
<td>30.7</td>
<td>7.7</td>
<td>23.1</td>
<td>1.3</td>
<td>(1.2, 1.4)</td>
</tr>
<tr>
<td>35-44</td>
<td>35.6</td>
<td>8.0</td>
<td>27.7</td>
<td>1.3</td>
<td>(1.2, 1.4)</td>
</tr>
<tr>
<td>45-54</td>
<td>39.9</td>
<td>9.1</td>
<td>30.8</td>
<td>1.3</td>
<td>(1.2, 1.4)</td>
</tr>
<tr>
<td>55-64</td>
<td>43.4</td>
<td>10.2</td>
<td>33.3</td>
<td>1.3</td>
<td>(1.2, 1.4)</td>
</tr>
<tr>
<td>65-74</td>
<td>46.8</td>
<td>11.9</td>
<td>34.9</td>
<td>1.3</td>
<td>(1.2, 1.4)</td>
</tr>
<tr>
<td>75+</td>
<td>49.4</td>
<td>12.2</td>
<td>37.2</td>
<td>1.3</td>
<td>(1.2, 1.4)</td>
</tr>
</tbody>
</table>

Table 2. Prevalence ratios (PRs) for asthma between the MS and non-MS cohorts.

<table>
<thead>
<tr>
<th>Race</th>
<th>White Americans</th>
<th>African Americans</th>
<th>P-values</th>
<th>White Americans</th>
<th>African Americans</th>
<th>P-values</th>
<th>All</th>
<th>P-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRs adjusted for age, gender, and MS dx</td>
<td>2.48 (2.48,2.48)</td>
<td>1.48 (1.48,1.48)</td>
<td>&lt;0.001</td>
<td>2.87 (2.87,2.87)</td>
<td>1.48 (1.48,1.48)</td>
<td>&lt;0.001</td>
<td>2.61 (2.61,2.61)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>