It is estimated that out of the approximately 6.1 million children with asthma, 53.7% have experienced at least one asthma exacerbation. 1 In 2015, there were approximately 1.5 million emergency department visits with asthma as the primary diagnosis. 1,2 Only eighty percent of children with asthma exacerbations will have an associated viral infection. 1,3,4,5 Defining future risk for exacerbations and exacerbations of asthma has been an evolving field over the years, especially as it relates to viral infection.

Recently, a group designed and validated the Pediatric Asthma Risk Score. The authors evaluated 762 children from a birth cohort, of which 59% developed asthma at the age of 7. They found that there were 8 predictors of development of future asthma.

Methods: We recruited 210 subjects ages 0-3 years old with and without wheezing. Subjects were recruited in four seasons. Nasopharyngeal swabs and nasal filters were collected. Viral genome sequencing was performed using bead arrays. Immunologic analyses were performed. Pediatric Asthma Risk Score (PARS) was obtained using a standardized tool.

Results:

- Acute symptoms are worse in those at high risk for future asthma. More work is required to determine if these scores actually predict future asthma in these subjects.

Conclusions:

- Viral infection causes increased acute symptoms in those with high risk for exacerbations and wheezing at presentation.
- Inflammatory mediators may be useful in determining asthma risk.
- Antiviral cytokines trend lower in subjects at high risk for future exacerbations.
- Th2 biasing cytokines trend higher in those with high risk for future asthma.

References:

1. www.cdc.gov

Figure 1: PARS Risk Stratification. A) Red is Th2 biasing cytokines and chemokines previously shown to correlate with acute exacerbations and asthma. B) Green is anti-viral cytokines. C) Blue is Th2 biasing cytokines and inflammatory mediators.

Figure 2: Acute Symptoms at Presentation. A) Acute symptoms were highest in subjects who were wheezing compared to those who were not at presentation (p=0.0001). B) Acute symptoms were highest in those with high risk by PARS and wheezing compared to subjects with low risk of asthma and wheezing at presentation (p=0.05).

Figure 3: Frequency of Positive Viral Tests Comparing Cohorts. (Other Viruses include rhinovirus, parainfluenza, human para influenza, and influenza.)

Figure 4: Acute Symptoms at Presentation. Represents acute symptoms at presentation comparing PARS risk in subjects with and without virus. In only those who were wheezing at presentation. Wheezing subjects with high risk for future asthma based on PARS and a virus had the highest acute symptoms at the time of presentation compared to low risk wheezing with a virus (p=0.05).

Figure 5: Distribution of Viral Cytokines. PARS Stratification.

Table 1: Demographics

<table>
<thead>
<tr>
<th></th>
<th>Cohort (n=109)</th>
<th>Wheezing (n=109)</th>
<th>Not Wheezing (n=307)</th>
<th>Low Risk (n=696)</th>
<th>Medium Risk (n=102)</th>
<th>High Risk (n=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>6.1</td>
<td>6.1</td>
<td>5.9</td>
<td>6.0</td>
<td>6.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Male (%)</td>
<td>53.7%</td>
<td>53.7%</td>
<td>53.7%</td>
<td>53.7%</td>
<td>53.7%</td>
<td>53.7%</td>
</tr>
<tr>
<td>PARS (%)</td>
<td>58.6</td>
<td>58.6</td>
<td>58.6</td>
<td>58.6</td>
<td>58.6</td>
<td>58.6</td>
</tr>
</tbody>
</table>

Abstract

Rationale: The Pediatric Asthma Risk Score was recently validated to provide physicians with information regarding their patients’ future risk of developing asthma. We wanted to know if infants and toddlers with high risk (HR) for future asthma would present with more acute symptoms during wheezing events than those with low risk (LR). We were also interested in biomarkers that would predict similarly.

Methods: We recruited 210 subjects ages 0-3 years from the Emergency Department. Baseline Pediatric Respiratory Symptoms (PRS) Scores were recorded. Pediatric Asthma Risk Score was obtained for each subject. Nasopharyngeal swabs were used to detect the presence of multiple viruses by viral genome sequencing. Nasal filter paper was used to collect nasal mucus lining fluid, and after elution, inflammatory mediators were analyzed using bead-array immunoassay.

Results: Those subjects with HR for asthma had higher symptom scores as measured by PRS than those with LR (HR mean [SD], 7.1 [3.93]; LR, 3.83 [3.17]; p<0.0001). High risk patients were more likely to present towards more severe symptoms than HR patients without viral infection (HR virus, 9.182 [3.195]; LR virus, 5.1 [2.826]; p<0.00).

Conclusions: Acute symptom scores at the time of wheezing illnesses are worse in those at HR for future asthma. More work is required to determine if these scores actually predict future asthma in these subjects.

Introduction

Children with high risk to develop asthma by the Pediatric Asthma Risk Score have more acute symptoms at presentation for wheezing than those who are low risk.

Kelsi Pomeroy, MS1; Ashley N Stoner, MD2; John C Kincaid, MD3; Claire Putt, BA, MPhil1; Kurt C Schwalm, BS4; Darrell Diwiddie, PhD5; Joshua L Kennedy, MD, MPH1,6,7

1Arkansas Children’s Research Institute; 2University of Arkansas for Medical Sciences, Little Rock, AR; 3University of New Mexico Health Science Center, Albuquerque, NM