Association Between Tree Pollen Counts and Asthma ER Visits in a High-Density Urban Center

Sunit P. Jariwala, MD
Division of Allergy & Immunology
Albert Einstein College of Medicine, Bronx, NY
Disclosures

• Dr. Jariwala has no financial disclosures to report.
Background

• Asthma morbidity and mortality are very high among minority inner-city populations.

• The New York City borough of the Bronx, has high rates of asthma-related hospitalizations and mortality.

• The annual asthma-related hospitalization rate in the Bronx is 0.57% as compared to the U.S. rate of 0.14%.
High tree pollen counts correlated with a large increase in Asthma ED visits in 1999

• In a prior analysis of data from 1999, we found that a large spring increase in Asthma related ED visits (AREDV) closely correlated with high tree pollen counts.

• These findings were consistent among adult and pediatric AREDV, which showed similar patterns throughout the year.
Literature Review

• Dales RE, Cakmak S, et al. JACI, Feb 2004 (Canada)
  
  – Study investigated the association between daily changes in aeroallergens and daily changes in hospitalizations for asthma during a 7-year period between 1993 and 2000 in 10 of the largest cities in Canada.
  
  – Tree pollen was associated with 2.9% increase in asthma hospitalizations in Canada.
  
  – Fungal spores tended to have a greater influence on asthma-related hospitalizations than pollen counts.
Literature Review

  
  - Administration of omalizumab was associated with decreased spring-related asthma exacerbations in inner-city children, adolescents and young adults.
  
  - Patient population selected due to the high asthma morbidity in inner-city children.
  
  - Data suggest that targeting an allergic component among inner-city asthmatics offered a benefit beyond conventional therapy.
  
  - Decreases in asthma exacerbations were seen in all levels of asthma severity.
Literature Review

• Darrow LA, Hess J, et al. JACI, Sept 2012 (Atlanta, GA)
  
  – Pollen independently contributed to asthma morbidity in Atlanta with a 10% to 15% increased risk of asthma-related ED visits on days with the highest pollen concentrations.
  
  – Observed a 2 to 3% increased risk of asthma-related ED visits per standard deviation increase in pollen (Quercus and Poaceae species) levels.
  
  – Association for Quercus species was strongest for children aged 5 to 17 years.
Literature Review

• Sheffield PE, Weinberger KR, et al. ISRN Allergy, April 2011

  – Peak of allergy medication sales in New York City occurs in late April to early May.

  – Spring medication peak coincides with peak concentrations of certain tree pollens including maple, birch, ash, and oak.
The association between asthma-related emergency department visits and pollen and mold spore concentrations in the Bronx, 2001-2008


- Daily adult and pediatric asthma-related emergency department visits (AREDV) and asthma-related hospitalizations (ARH) from 2001 - 2008 were obtained from two Bronx hospitals (Montefiore-Moses and Montefiore-Weiler).

- Daily counts for tree, grass and weed pollen and mold spore counts from March 2001 to October 2008 were obtained from the Armonk counting station in Westchester County.
Key Findings

• From 2001-2008, there were a total of 42,065 AREDV.

• There was a large spring peak in total AREDV.
Tree pollen counts significantly correlated with both AREDV and ARH

- Tree pollen counts significantly correlated with
  - Total AREDV ($\rho = 0.3639, P < 0.001$)
  - Pediatric AREDV ($\rho = 0.33, p<0.001$)
  - Adult AREDV ($\rho = 0.28, p<0.001$)

- ARH positively correlated with tree pollen counts ($\rho = 0.2389, P <0.001$).
Median pollen, mold counts, asthma-related ED visits and asthma-related hospitalizations 2001-2008

Total AREDV

Tree pollen peak
AREDV strongly associated with total pollen counts

- When comparing the mean daily AREDV\textsubscript{s} in the highest quartile of pollen counts with the mean daily AREDV\textsubscript{s} of all other quartiles, we found a strong association between high pollen counts and increased asthma ED visits.

- When daily pollen counts exceeded 100 particles/m\textsuperscript{3}, AREDV increased from a mean of 11.4 (+/- SD 6.6) to a mean of 17.1 (+/- SD 8.2), p<0.001.
Association between asthma ED visits and total pollen counts

P<0.001

P<0.001
Which other variables might affect AREDV?

• As a follow-up study, we recently looked at daily measurements of humidity, temperature, air pollutant (nitrogen dioxide and particulate matter 2.5) concentrations, and tree pollen counts.

• We categorized these variables into quartiles and compared these variables in relation to AREDV.
Tree pollen counts drive the AREDV spring peak

• The highest quartile of daily tree pollen counts resulted in consistently high AREDV, regardless of pollutant or humidity measurements.

• In contrast, on days when humidity and air pollution levels were high, but tree pollen counts were low, AREDV were not significantly increased.
Conclusions

• Asthma morbidity and mortality are very high among minority inner-city populations.

• In a highly urbanized area such as the Bronx, there exists a significant association between spring asthma-related ED visits and tree pollen concentrations.

• Early anticipation of spring pollen peaks based on ongoing surveillance could potentially guide clinical practice and minimize asthma-related ED visits in the Bronx.
Acknowledgments

• Dr. David Rosenstreich
• Dr. Jennifer Toh
• Dr. Mili Shum
• Dr. Gabriele de Vos
• Dr. Golda Hudes
• Dr. Elina Jerschow
• Dr. Sayantani Sindher
• Dr. Payal Patel
• Dr. Jason Fodeman