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ORIGINAL ARTICLE

Does atopy affect the course of viral pneumonia?

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KEYWORDS
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Abstract
Background: The presence of atopy is considered as a risk factor for severe respiratory symptoms in children. The objective of this study was to examine the effect of atopy on the course of disease in children hospitalised with viral pneumonia.
Methods: Children between the ages of 1 and 6 years hospitalised due to viral pneumonia between the years of 2013 and 2016 were included to this multicentre study. Patients were classified into two groups as mild–moderate and severe according to the course of pneumonia. Presence of atopy was evaluated with skin prick tests. Groups were compared to evaluate the risk factors associated with severe viral pneumonia.
Results: A total of 280 patients from nine centres were included in the study. Of these patients, 163 (58.2%) were male. Respiratory syncytial virus (29.7%), Influenza A (20.5%), rhinovirus (18.9%), adenovirus (10%), human metapneumovirus (8%), parainfluenza (5.2%), coronavirus (6%), and bocavirus (1.6%) were isolated from respiratory samples. Eighty-five (30.4%) children had severe pneumonia. Atopic sensitisation was found in 21.4% of the patients. Ever wheezing (RR: 1.6, 95% CI: 1.1–2.4), parental asthma (RR: 1.5, 95% CI: 1.1–2.2), other allergic diseases in the family (RR: 1.8, 95% CI: 1.2–2.9) and environmental tobacco smoke (RR: 1.6, 95% CI: 1.1–3.5) were more common in the severe pneumonia group.

Abbreviations: RV, rhinovirus; RSV, respiratory syncytial virus; hMPV, human metapneumovirus; RT-PCR, real-time reverse transcription polymerase chain reaction; SPT, skin prick tests; BMI, body mass index; ETS, environmental tobacco smoke exposure.

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Conclusions: When patients with mild–moderate pneumonia were compared to patients with severe pneumonia, frequency of atopy was not different between the two groups. However, parental asthma, ever wheezing and environmental tobacco smoke exposure are risk factors for severe viral pneumonia in children.

Introduction

Interaction between asthma and viral infections has been known for a very long time. Attention has been drawn in many studies to decreased antiviral response in patients with asthma.[1] Epithelium damage, disrupted epithelium repair mechanisms, inflammation and insufficient immune response that occur in asthma cause these patients to become more sensitive to airway irritants as well as viral infections.[2] Atopy, which refers to the genetic tendency to develop allergic diseases such as allergic rhinitis, asthma and atopic dermatitis and viral infections, disrupts the integrity of the epithelium barrier by way of synergic effect on the respiratory tract. This damage on the respiratory epithelium causes the onset of inflammation, thus triggering wheezing episodes and asthma.[1,3–5] Inflammation in the respiratory tract due to atopy in addition to the disruption of the epithelial barrier integrity places these patients under risks of severe viral lower respiratory tract infections.

Atopic children are more at risk for severe pneumonia during pandemic influenza epidemics.[6–8] Also, the first Rhinovirus (RV) infection in patients with asthma is generally in the form of lower respiratory tract infection and it is more severe and lasts longer.[5,9] It was put forth in a prospective cohort study that the risk of hospitalisation due to severe Respiratory syncytial virus (RSV) infection is greater in atopic children in comparison with the control group.[10] It is also reported that asthma and atopic dermatitis increase the risk of pneumococcal infections.[11] Recent studies show that atopic sensitisation emerges prior to respiratory tract infections. Both viral illness and allergic sensitisation/exposure increase risks of severe respiratory tract diseases that require hospitalisation.[12] The objective of this study was to examine the effects of the presence of atopy on the course of disease in children hospitalised with viral pneumonia. We hypothesised that atopic children are at increased risk for severe pneumonia with viral infections.

Materials and method

All children between the ages of 1 and 6 years hospitalised with a viral pneumonia between 01/11/2013 and 01/01/2016 were included in this multicentre prospective study. Cases with chronic disease including asthma, gastroesophageal reflux, tracheomalacia, tuberculosis, congenital heart disease, cystic fibrosis, primary ciliary dyskinesia, vascular ring, bronchopulmonary dysplasia, or immune deficiency were excluded from the study. Presenting symptoms of the patients, laboratory findings, radiological findings and duration of hospitalisation were recorded.

Atopy

Atopy is defined as positive skin prick tests (SPT) to one or more allergens.

Virus detection and identification

Virus detection and identification were carried out in the nasopharyngeal aspirates example via real-time reverse transcription polymerase chain reaction (RT-PCR) method (Fast Track Diagnostics Luxembourg S.'a.r.l).

Skin prick test

Presence of atopy was evaluated by skin prick tests (SPT). All participants had SPTs for *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, *Alternaria alternata*, cat, grass mix (*Phleum pratense*, *Poa pratensis*, *Dactylis glomerata*, *Lolium perenne*, *Festuca pratensis*, and *Avena eliator*), tree mix (*Betula verrucosa*, *Alnus glutinosa*, and *Coryllus avellena*), *Olea europea*, *Blatella germanica*, histamine, and negative controls. Standardised core allergen extracts and controls were provided by ALK-Abello, Horsholm, Denmark. The tests were administered using prick test device on the volar surface of both forearms and recorded after 15 min and considered as positive if the mean wheal diameter was 3 mm larger compared to the negative control. Positive SPT was defined as a wheal $\geq$3 mm to one or more allergens. SPT of patients who had received corticosteroid therapy were performed four weeks after hospital discharge. On the other hand, SPT were performed after completion of pneumonia treatment in patients who had not received steroids.

Severity of viral pneumonia

Patients were classified into two groups as mild–moderate and severe according to the course of pneumonia. The patients were considered to have severe pneumonia if at least one of the following criteria was present[5]:

SpO_2 < 90% (in ambient air)
2nd or 3rd stage intensive care or mechanical ventilation support requirement
Development of atelectasis or effusion
Impaired consciousness (tendency to sleep, lethargy, confusion, unresponsiveness to painful stimulant)
Excessive dehydration
Apnoea

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