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Research Article

Human Metapneumovirus Pneumonia in Adults: A 5 Years Institutional Experience

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Abstract

Background: The aim of this study was to describe the clinical characteristics of young adults with documented human Metapneumovirus (hMPV) infection at our institution.

Methods: This retrospective analysis was done at University of North Carolina. Charts of patients who tested positive for hMPV by Luminex xTAG RVP assay from 1/1/2009 through 12/31/2014 were analyzed. Demographics, symptoms/signs, comorbidities, hospital course, treatment and disposition were recorded.

Results: Total 33 patients tested positive for hMPV during the study period. The mean age of these patients was 51 +/- 21 (SD). Total 15/33 (45%) patients had underlying chronic lung disease. Seven patients (21%) had a history of malignancy and seven patients (21%) were on immunosuppressant medications. Ten patients (30%) required ICU care, of which 7 were intubated. Four (12%) ICU patients died during their hospitalization. Total 30/33 patients in the study were treated with antibiotics and 15/33 received steroids. Four patients (12%) were treated with ribavirin.

Conclusions: Human Metapneumovirus is a common pathogen which often presents with cough dyspnea and infiltrate on chest radiograph. Though adults hospitalized with hMPV often have multiple co-morbidities, previously healthy patients and younger adult patients still need to be considered for this illness.

Keywords: *Metapneumovirus; Human Metapneumovirus; Pneumonia*

Introduction

Metapneumovirus (hMPV) was first described in 2001 in a case series of 28 hospitalized children in the Netherlands over a 20 year period [1]. Serological evidence of human infection has been dated back to 1958 [1]. hMPV is a single stranded RNA virus in the Paramyxoviridae family and it has been associated with respiratory tract infections in all age groups. It is estimated to account for 5 to 7% of respiratory tract infections in hospitalized children [2]. The virus primarily circulates in the late winter and spring [3]. In temperate countries, hMPV has a seasonal distribution which overlaps with RSV [4]. Human metapneumovirus can cause a spectrum of disease, from upper respiratory illness to respiratory failure [5]. Adult cases are becoming more prevalent in the literature [5]. We describe our institutional experience in adult patients with human metapneumovirus infection. We have enough literatures on the human metapneumovirus infections in children but we lack the data on young adults, most of them are empirically treated for bacterial infections which might not be necessary. The aim of our study was to define the characteristics of the human metapneumovirus infections in the young adults and their outcomes.

Methods

We retrospectively reviewed the electronic medical records of patients who tested positive for hMPV by Luminex xTAG RVP assay from 1/1/2009 through 12/31/2014 at University of North Carolina Hospitals in Chapel Hill, North Carolina. The protocol entailed review of existing medical records with minimal risk to patients, so the requirement of informed written consent was waived by the institutional review board of the University of North Carolina at Chapel Hill.

The study was performed at an academic tertiary care center of a major university. Subjects were excluded if they were not admitted to the hospital or were less than 18 years of age. Medical records and images were located in a Web-based server. All data was collected by reviewing electronic medical records.

The records of 33 patients were reviewed. Information that was recorded included presenting symptoms based on review of the history and physical note. Comorbidities were recorded based on the patient's past medical history and divided into categories including lung disease, history of malignancy, hypertension, diabetes mellitus, heart disease, liver disease, alcohol abuse, and history of solid lung transplant. Smoking history, use of home oxygen and medications prior to illness were recorded.

Results

Total 33 patients tested positive for hMPV during the study period (Table 1). The incidence peaked in late winter and early spring. The mean age of these patients was 51 +/- 21 (SD). There were 18 females and 15 males. There were 22 Caucasians, 7 African Americans and 4 Asians. The most common presenting symptoms in these patients were cough 24/33 (73%), dyspnea 20/33 (61%) and fever 20/33 (61%). Total 15/33 (45%) patients had underlying chronic lung disease. Nine patients had COPD, 4 had asthma (well controlled), 1 had obstructive sleep apnea (on CPAP) and one had cystic fibrosis. There were 3 patients with prior history of pulmonary infections (pulmonary aspergillosis, pulmonary tuberculosis and community acquired pneumonia). Seven patients (21%) had a history of malignancy and seven patients (21%) were on immunosuppressant medications. Mean FEV1 in patients with underlying lung disease was 32 +/- 13% SD, while the mean FEV1 in patients with no history of chronic lung disease were 80 +/- 16%. On initial presentation chest radiographs revealed bilateral infiltrates in 11/33 (33%) unilateral infiltrate in 10/33 (30%) and no infiltrate in 12/33 (36%). Ten patients (30%) required ICU care, of which 7 were intubated. Five patients underwent bronchoscopy. Two patients had concomitant rhinovirus infection, one had concomitant adenovirus and one had influenza A. Four (12%) ICU patients died during their hospitalization. Out of the 4/33 deaths in ICU, two patients had acute myeloid leukemia (AML) and were immunosuppressed with medications; one had metastatic lung cancer and one had severe COPD (FEV1 24%). One patient with history of debilitating stroke who was admitted in the ICU with human metapneumovirus infection chose comfort care and passed away 2 weeks later in hospice care. None of these patients had concomitant other viral infections. Surprisingly, only one patient with AML was treated with Ribavirin. Total 30/33 patients in the study were treated with antibiotics and 15/33 received steroids. Four patients (12%) were treated with ribavirin. Five patients were empirically treated with oseltamivir.

Number of patients	33
Mean age	51 +/- 21 (SD)*
Sex	18 Females 15 Males
Race	22 Caucasians 07 African American 04 Asian
History of lung disease	09 COPD 04 Asthma 01 Cystic fibrosis 01 Obstructive sleep apnea
Another past lung history (Treated)	02 Cystic Fibrosis s/p DLT* 01 Pulmonary aspergillosis 01 Pneumonia
History of malignancy	03 AML (1 s/p BMT; one on active chemotherapy) 01 Metastatic lung cancer 01 Prostate cancer (treated) 01 Breast cancer (treated) 01 Multiple Myeloma (s/p BMT)
Mean FEV1	32 +/- 13 SD (History of chronic lung disease) 80 +/- 16 SD (Normal lungs)
Immunosuppressant	07/33
Concomitant viral infection	02 Rhinovirus 01 Adenovirus 01 Influenza A
Morbidity	10/33 required ICU
Mortality	04/33

Table 1: *Clinical characteristics of the patients.*

**SD: Standard Deviation; DLT: Double Lung Transplant; AML: Acute Myeloid Leukemia; BMT: Bone Marrow Treatment.*

Discussion

Our study describes the clinical characteristics and hospital course of adult inpatients with hMPV infection at an academic hospital. A substantial number of patients in our study required admission to the intensive care unit. Seventy percent of the patients requiring intensive care unit were intubated. A majority of patients who tested positive with hMPV had comorbid conditions, such as underlying lung disease, malignancy, or were organ transplant recipients. Only one young adult without an underlying condition tested positive for hMPV in our study and she had concomitant influenza A infection. Notably, seventy percent of the patients admitted to intensive care were intubated and thirty percent of them met clinical criteria for ARDS. This is a finding similar to Hasvold., *et al.* [5] whose study recorded a 31 percent intensive care unit admission rate. The mean age of the patients in our study was younger than previous studies of hospitalized patients with hMPV infection [6]. These findings are in contrast of a study conducted by Hopkins [7] that showed despite a 30% rate of infection with hMPV among lung transplant recipients (30%) none progressed to respiratory failure.

Patients presented with a variety of clinical symptoms. The most common symptoms were cough, dyspnea, and fever. Similar to other studies, presentation on chest radiograph was variable and no finding could be considered pathognomonic for hMPV infection [8,9].

The present study reinforces several findings previously documented in the hMPV literature. This includes the impact hMPV infection can have on those with underlying lung disease, transplant recipients, and in those individuals who are immunosuppressed [10-14]. Our study also demonstrated rates for intensive care unit admission and need for mechanical ventilation similar to other studies [6,15,16]. However not all studies demonstrate progressive respiratory decline with hMPV infection. In a study conducted by Hopkins., *et al.* [7] hMPV infection was more common than RSV among lung transplant recipients. In this study no patients progressed into respiratory failure despite hMPV infection and confirmed coexisting bacterial infection in 90% of patients.

Young patients are often asymptomatic [3,17]. In a study conducted by Walsh., *et al.* [17] 71 percent of patients aged 19 to 40 had asymptomatic hMPV infection. In our study approximately 30% were 40 years old or younger. All but one had a comorbid condition that would predispose them to more severe illness and she was coinfected with influenza A. Further hMPV can have similar impact as influenza [18].

Our study has several limitations. As this is a retrospective analysis several data points are missing that may have impacted our results. Many of our patients did not have blood or respiratory cultures sampled. Because of this, superimposed bacterial infections may have been missed. Additionally, not all patients had BAL samples. Previous studies have shown diagnosis of hMPV by BAL to be effective. However, many studies have demonstrated that reverse transcription polymerase chain reaction (RT-PCR) is the most sensitive method for testing for hMPV.

Unfortunately, sufficient evidence does not currently exist to support a specific medical therapy. Ribavirin and IVIG have been used with variable results. Efforts to produce a vaccination are underway but are not yet available. At this time supportive care and isolation precautions are the mainstay of therapy. The possibility of concomitant viral or bacterial infection also needs to be considered during the treatment of hMPV positive patients. Our study demonstrates that hMPV is an important cause of illness in adult patients with underlying lung disease and in those who are immunosuppressed. Although, there is not a proven treatment for this viral illness it is important to keep it in mind that patients with chronic medical conditions, particularly the immunosuppressed and the ones with underlying malignancy should be watched very closely in the ICU and perhaps treated early with Ribavirin

Conclusions

Human metapneumovirus is a common pathogen which often presents with cough, dyspnea and infiltrate on chest x-ray. Though adults hospitalized with hMPV often have multiple co-morbidities, previously healthy patients and younger adult patients still need to be considered for this illness. Individuals requiring ICU care were more likely to be older and have more medical comorbidities. Mortality was higher in this group. The assay used to detect this virus is relatively new, so the increased incidence we have experienced recently may be due to the historical under-recognition of this virus

Conflict of Interest

The authors report no real or potential conflict of interest.

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Author's Contribution:

- Vikas Pathak: Study design, data collection, manuscript preparation.
- Anna Conterato, MD: Data collection.
- Jeremy Wininger: Manuscript preparation.

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