Surveillance of acute respiratory infections in hospitalized patients: evaluation of an automated multiplex PCR assay

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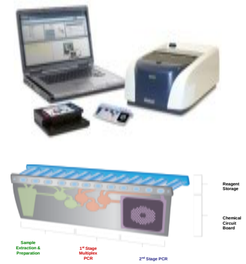
INTRODUCTION AND AIMS

Acute respiratory infections (ARI) are responsible for considerable morbidity and mortality in both immunocompetent and immunocompromised hospitalized patient.
A rapid and definitive diagnosis is critical in the management of acute respiratory infections and in timely isolation of infected patients .
Nucleic acid amplification testing (NAAT)-based methods are widely used as lab assays for the detection of viral pathogens from respiratory specimens improving diagnostic yield in comparison to traditional methods such as viral culture, immunochromatographic antigen testing, and direct fluorescent-antibody (DFA) testing. In particular, multiplex molecular assays have been increasingly developed in recent years allowing a rapid and simultaneous detection of a wide panel of respiratory pathogens.
The aim of this study was to investigate the etiology of respiratory infections among pediatric and adult hospitalized patients admitted to "Città della Salute e della Scienza di Torino" University Hospital- Italy, using a multiplex PCR assay (Film Array Respiratory Panel- *Biomerieux*) able to detect respiratory viruses and fastidious bacteria.

MATERIALS AND METHODS

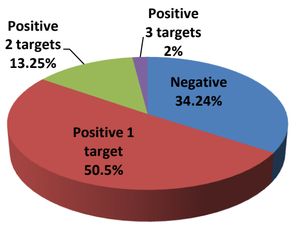
The study was a retrospective cohort study of 400 hospitalized pediatric patients ≤ 18 years old (male/female, 212/288 ; mean age 6.1 ; median age 4; range 1 month-18 years) and 518 hospitalized adult patients ≥ 18 years old (male/female 305/213 ; mean age 59 years ; median age 61; range 19-82) who presented symptoms of acute respiratory infection since January 2014 to August 2016.
Overall, 573 nasal or throat swabs (pediatric/adults 392/181) and 345 bronchoalveolar lavages (pediatric/adults 8/337) were collected and analyzed by using FilmArray Respiratory Panel, a autometed multiplex PCR.



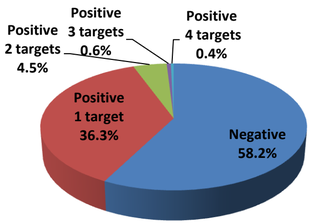
RESULTS

Overall, 65.75% (263/400) of samples from pediatric patients were positive for respiratory pathogens (86 from infants 0-12 months-old, 71 from 1-18 years-old children and 106 from 1-18 years old children with haematological/oncology comorbities; among the total positive samples, 50.5% were found positive for at least one target, and 15.25% contained two or three pathogens.

In comparison, as observed in others recent studies (18) the adult population showed a lower positivity rate (65.75 vs 42.28 %, p< 0.001) and a lower co-infection rate (15.25 vs 5.6%, p=0.005).



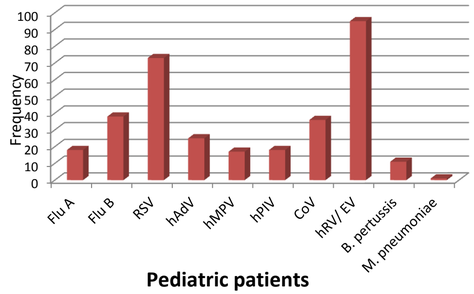
Pediatric patients



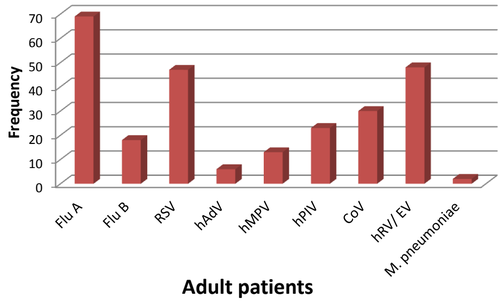
Adult patients

The distribution of detected pathogens was statistically different between adult and pediatric population (p<0.001) (tab 1): a higher positivity rate in pediatric patients for hRSV (18.25 vs 9.07%, p<0.001), hAdV (6.25 vs 1.16%, p<0.001), hRV/enterovirus (23.75 vs 9.27%, p<0.001), Flu B (9.5 vs 4.47%, p<0.001) and a lower positivity rate for FluA (4.5 vs 13.32%, p<0.001); no statistical significant difference for the others targets was observed.

In pediatric population hRV/enterovirus, hRSV, Flu , hAdV and hMPV were the most prevalent viruses, 1/400 of samples was positive for M. *pneumoniae*, and in 11/400 samples were detected B. pertussis; in adult population the higher prevalence was observed for FluA, followed by hRV/enterovirus, hRSV, Flu B and the others targets. In both populations PIV 3 was the most frequent parainfluenza virus, the four CoV types had similar distribution and C. *pneumoniae* was detected in no sample.

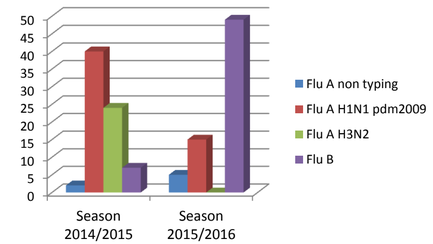


Pediatric patients



Adult patients

The Multiplex PCR used in this study allowed the identification of type A and B of Influenza Virus and the subtype A H1, A H1N1 pandemic 2009, A H3, and A non typing. Comparing Flu season 2014/2015 with 2015/2016 was observed in the first season a higher prevalence of FluA H1N1 pdm 2009 (40/73, 54.79% of the total Flu cases) followed by H3 (24/73, 32.88%), Flu B (7/73, 9.59%) and FluA non typing (2/73, 2.74%); on the contrary in the second season FluB had higher prevalence (49/69, 71.01%), followed by FluA H1N1 pdm 2009 (15/69, 21.74%), FluA non typing (5/69, 7.25%) and no detection of FluA H3.



CONCLUSIONS

Our findings exemplify the epidemiology of respiratory pathogens in a major hospital in Italy during two Flu seasons.
Film Array Respiratory Panel proved to be a valid method for a rapid etiological diagnosis of acute respiratory infection. Clinical evaluation may be useful to understand the relative role of different pathogens in co.infections.