**Influenza and Respiratory Syncytial Virus during the COVID-19 pandemic: time for a new paradigm?**

**Emma Binns1, Marianne Koenraads2, Lidia Hristeva3, Alix Flamant4, Sebastian Baier-Grabner5, Mervin Loi6, Johanna Lempainen7, Elise Osterheld8, Bazlin Ramly9,10, Jessica Chakakala-Chaziya11, Niveditha Enaganthi12, Silvia Simó Nebot13, Danilo Buonsenso14, 15, 16**

1 Department of Paediatrics, Christchurch Hospital, Christchurch, New Zealand

2 Paediatric Specialist Trainee, Alder Hey Children’s Hospital, Liverpool, UK

3 General Paediatrics/Neonates, UK

4 Paediatric Resident, Cliniques Universitaires Saint-Luc, Brussels, Belgium

5 Department of Paediatrics and Adolescent Medicine, Klinik Ottakring, Vienna Healthcare Group, Vienna, Austria

6 Children’s Intensive Care Unit, KK Women’s and Children’s Hospital, Singapore

7 Department of Paediatrics, Institute of Biomedicine and Clinical Microbiology, University of Turku and Turku University Hospital

8 Department of Paediatrics, Centre Hospitalier de Mayotte, Mayotte, France

9 Paediatric Department, Children Health Ireland, Dublin, Ireland

10 Paediatric Department, Hospital Raja Permaisuri Bainun, Ipoh, Malaysia

11 Paediatric Department, Muzu Central Hospital, Ministry of Health, Malawi

12 Paediatric Department,Sri Ramachandra Medical College & RI ,Chennai,Tamil Nadu,India

13 Infectious diseases and systemic inflammatory response in Paediatrics, Infectious Diseases Unit, Sant Joan de Déu Hospital Research Foundation, Barcelona, Spain

14 Department of Woman and Child Health and Public Health, Fondazione Policlinico Universitario A. Gemelli IRCCS, Rome, Italy

15 Dipartimento di Scienze di Laboratorio e Infettivologiche, Fondazione Policlinico Universitario A. Gemelli IRCCS, Rome, Italy.

16 Global Health Research Institute, Istituto di Igiene, Università Cattolica del Sacro Cuore, Roma, Italia

*\*Corresponding author:*Danilo Buonsenso,

Largo A. Gemelli 8, 00168, Roma, Italy.

Email: [danilobuonsenso@gmail.com](mailto:danilobuonsenso@gmail.com)

Tel: 0039 063015 4390

Twitter: @surf4children

*Running Head:* **Influenza and RSV during the COVID-19 pandemic:**

**Funding:** no funds received

**Conflicts of interest:** nothing to declare

**Key Words**

COVID-19 ; SARS-COV-2 ; influenza ; respiratory syncytial virus

**Abstract**

Seasonal epidemics of influenza and the respiratory syncytial virus are the cause of substantial morbidity and mortality among children. During the global COVID-19 pandemic, the epidemiology of these viruses seems to have changed dramatically. In Australia and New Zealand, a significant decrease in both influenza and bronchiolitis have been noticed during usual peak seasons. Data from early months of winter seasons in Europe are showing similar trends.

This current scenario imposes a reconsideration of the paradigm that toddlers and young schoolchildren are the main drivers of seasonal RSV outbreaks and respiratory epidemics in general.

In this paper, we summarize current literature, address current knowledge or role of adults in the respiratory syncytial virus epidemiology, describe the lessons learned from pertussis epidemics and call the international community to better understand the community transmission dynamics of respiratory infections in all age groups. This can allow the establishment of better and more affordable preventive measures in the whole population level, which can ultimately save millions of child lives.

**Key Words**

COVID-19 ; SARS-COV-2 ; influenza ; respiratory syncytial virus

During the global course of Postgraduate Diploma in Paediatric Infectious Diseases at Oxford1 the members of the course have reviewed the recent incidence of respiratory infections and the role of children and adults in transmission. The findings in 2020 have shown new epidemiology of respiratory infections.

While the COVID-19 pandemic has a lower clinical impact on children compared to adults2,3, children have been significantly affected by its indirect consequences, due to restrictive measures that have potential implications on child’s social, mental and learning development.4 Nevertheless, a possible beneficial, unexpected effect of the pandemic on children’s health has been recently described.

Seasonal epidemics of influenza and the respiratory syncytial virus (RSV) are the cause of substantial morbidity and mortality among children.5

During the global COVID-19 pandemic, the epidemiology of these viruses seems to have changed dramatically. In Western Australia, a decrease of 98.0-99.4% in the detection of RSV and influenza infections, respectively, was reported compared to the previous winter seasons from 2012 to 2019.6 This dramatic decrease in respiratory infections was sustained over the subsequent four-month period despite school re-openings. Similarly, in New South Wales, RSV detection between April to June 2020 was 94·3% lower than predicted based on comparison to 2015–2019.7 In New Zealand, where RSV season is from June to October and an aggressive elimination strategy effectively stamped out community transmission of COVID-19, a similar decline in seasonal respiratory infections was observed. Data from Kidz First Children’s Hospital, Auckland, demonstrated only 268 admissions of respiratory infections from January to end of August, 2020, in comparison with 1,486 to 2,046 annually in previous years (2015-2019).8 In Europe, which at the time of writing (end of December 2020) remains amid its bronchiolitis/influenza seasons, the first months of winter are showing a similar pattern.9 As of week 53, 2020, there were 33 reported cases of influenza, compared with 10616 reported cases at the same time last year. 9 Similarly, there has been only 30 reported cases of RSV (both adults and children) at week 53, compared with 3,895 reported cases in the same week last year. 9 Since laboratory testing is now mainly focused to detect SARS-CoV-2 infections, it is possible that the real burden of RSV and influenza is underestimated. However, reported hospitalizations of the more serious spectrum of disease (bronchiolitis) are equally reduced. This indicates that the reduction is not just a diagnostic bias.

Historically, RSV has been directly linked with the paediatric population since its recognition as a human pathogen.10 As early as 1976, Hall et al11 described that older siblings were the most likely index cases in household outbreaks, and subsequent studies over the years have also highlighted the role of older children in outbreaks11-14. These studies historically informed control strategies.15,16 However, by the end of 2019, even before the COVID-19 pandemic, there was increased interest in the role of RSV in adults. A recent systematic review on RSV epidemiology in adults and elderlies in Latin America17 found that RSV accounted for a considerable proportion of hospitalization in adults with influenza-like illness (69.9%) and community-acquired pneumonia (91.7%), suggesting that RSV may be a more significant cause of serious respiratory illness in adults than previously recognized. In Spain, Kestler et al prospectively assessed 1,200 patients admitted with an influenza-like respiratory infection, finding that 114 of the samples (9%) were positive for influenza and 95 (8%) were positive for RSV.18

The epidemic control measures during COVID-19 pandemic have thus changed also the regular epidemics of other respiratory viruses and the findings observed highlight a potential underestimated role of adults in the spread of RSV outbreaks and possibly other viral epidemics. Now, these findings need even more attention. During the first wave of the pandemic, almost all countries started complete lockdown with full school closures around March and April 20204 suggesting that the reduced social life of children was the main reason for the reduced burden of respiratory infections in children. However, since September many countries have reopened schools. In particular, almost all countries fully reopened kindergartens and primary schools, while some implemented partial closures or distance learning for older children (> 10-14 years of age). Importantly, for the youngest age group masking is not compulsory and safe distance, as well as frequent hand hygiene is not easily achievable. Therefore, those children traditionally linked with the RSV epidemics, namely kindergarteners and young schoolchildren, returned to almost normal life. Nevertheless, two months into the European winter, the “acute respiratory infection” season has not yet started. This observation allows speculation that since adults are the ones that have mostly changed their daily habits, may be the ones mostly contributing to the current change in RSV and influenza epidemiology in the northern hemisphere. A paper by McNab et al19 described delayed re-emergence of RSV in Victoria compared to New South Wales and Western Australia. This happened in the context of Victoria having prolonged lock-down due to the highest rates of community transmission of any state or territory in Australia. The resurgence of RSV occurred after lock-down ended and interstate borders re-opened. Childcares remained opened through most of the lock-down, further supporting the hypothesis of the potential role of adults in RSV transmission.

Although it may seem speculative, it is difficult to deny this statement since influenza and RSV cases in children seem to have significantly decreased since adults have started “keep distance”, “wearing masks” and “washing their hands more regularly”. Stronger influenza vaccination campaigns and widely supported by governments are also contributing to lower numbers of lower respiratory tract infections. However, historically the adherence to influenza vaccination is much lower in children compared to adults even despite the health services distributing the influenza vaccines free of charge for children aged 2-12 years old in certain countries.

This current scenario imposes a reconsideration of the paradigm that toddlers and young schoolchildren are the main drivers of seasonal RSV outbreaks and respiratory epidemics in general. Considering the historical impact of the RSV and flu seasons on childhood morbidity and mortality, this new scenario must lead us to perform a comprehensive study to establish the role of the wider community in respiratory infection outbreaks, including those diseases that historically kill children. Pertussis epidemiology is a well-known example of how extending surveillance to adults has increased understanding of pertussis epidemiology. It became clear around 2010 that focusing surveillance only on infants and children allowed to only detect the “tip of the iceberg” of the real pertussis epidemiology. Adults could act as a reservoir of infection toward young children. This concept derived from studies that estimated high incidence in adults based on serological assays and PCR, and from household contact studies, which identified adults and adolescents as frequent source of infection for infants.20

Recent changes in RSV and epidemiological scenarios, apparently influenced by drastic changes in adults’ habits, allow to hypothesise that pertussis and RSV may share several epidemiological paradigms.

As a community of young paediatric infectious disease registrars and specialists, we call on current international leaders, experts and funding agencies to prioritise these issues in research. A better understanding of community transmission dynamics of respiratory infections in all age groups can allow the establishment of better and more affordable preventive measures in the whole population level. This may save millions of child lives, reduce morbidity and diminish the psychological burden on children during outbreaks or epidemics. These measures may also be easily introduced in low-to-middle income countries, where respiratory infections kill the most.21

**Acknowledgements**

The authors of the paper are grateful with all teachers, tutors and students of the Post Graduate Diploma in Paediatric Infectious Diseases of the Oxford University for intellectual support. In particular, we are grateful to Professor Andrew Pollard and Professor Jussi Mertsola for their active support and contribution in reviewing the text.

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