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An Insight Into The Distribution Of COVID-19 & RSV In Paediatric Patients At GNCH September 2020 To February 2023

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The COVID-19 pandemic was a widely disruptive illness and affected children of all ages and background. The implementation of national lockdowns in the UK reduced the spread of COVID-19 but may have also affected exposure of most respiratory illness, including RSV. In a single centre retrospective study, we analysed anonymised data from paediatric patients attending the Great North Children's Hospital in Newcastle. The implementation of national restrictions showed a reduction in both COVID-19 and RSV infections. Upon easing of restrictions, RSV infections showed a much more dramatic rise than COVID-19. Upon easing of restrictions, RSV infections showed a much more dramatic rise than COVID-19 and the peak time of infection was seen in August 2021, much later than the normal winter peak seen. A higher median age of RSV infection (1-2 years) than previous years was shown. COVID infections demonstrated an expected rise following easing of national restrictions in July 2021. However, infection rates were much slower to reduce, possibly due to a smaller reservoir of natural immunity and showed further expected peaks in the winter months of 2021. Furthermore, COVID-19 infections continued to gradually decrease from January 2022. Overall, this data set shows the variability shown in the timing of RSV infections as a subsequent result of COVID-19 infections and national lockdown restrictions. It also highlights the changes in age groups effected by RSV and COVID-19 and the possible interaction these viral interactions may have had in children at this time.

Keywords– *COVID-19, infection, paediatric, RSV*

INTRODUCTION

The COVID-19 pandemic was a widely disruptive illness and affected children of all ages and background. The clinical course of the infection varied hugely, however, most infected children remained asymptomatic. [1] Nevertheless, as an infective disease, COVID-19 is more likely to affect susceptible children e.g. premature infants, neonates and children with compromised immune systems and long-term health conditions such as asthma [2], which led to increased morbidity. RSV is a highly contagious seasonal virus in the general population. 90% of children will contract the virus before their 2nd birthday and of those, 40% will develop a respiratory condition such as pneumonia, lower respiratory tract infections and bronchiolitis. [3] Although RSV infections occur throughout the year, cases are most seen in the UK between December and March, with the peak expected in January. [4]

The implementation of national lockdowns in the UK in 2020 and 2021 reduced the spread of COVID-19 but may also have affected the spread and exposure of most respiratory illness, including RSV. [5] [6]

I. A BETTER UNDERSTANDING OF THE VARIATION OF COVID-19 AMONGST CHILDREN AND THE INTERACTION OF COVID-19 AND RSV IS REQUIRED TO INFORM AND IMPROVE DISEASE RECOGNITION AND TREATMENT

BACKGROUND

IN A SINGLE CENTRE RETROSPECTIVE STUDY, WE ANALYSED ANONYMISED DATA FROM PAEDIATRIC PATIENTS ATTENDING OR AN IN-PATIENT AT THE GREAT NORTH CHILDREN'S HOSPITAL IN NEWCASTLE. A total of 42,532 COVID-19 and 12,592 RSV polymerase chain reaction (PCR) tests were performed between September 2020 and February 2021. Data collected included age of patient, specimen type, test result, collection date and reason for request and was analysed using Statistical Package for the Social Sciences (SPSS) 22.0 software.

METHODS

42,532 tests COVID-19 were performed, of which 1,139 (2.7%) were positive, 40,469 (95.1%) were negative and 924 (2.2%) were not performed. Children under 1 year old accounted for the highest number of positive tests and children 2-3 years old were the lowest age group effected.
12,592 RSV tests were performed, of which 1,247 (9.9%) were positive, 11,012 (87.5%) were negative and 333 (2.6%) were not performed. Children under the age of 1 year were most affected with rates of infection remaining high until 3 years of age.
The comparison of COVID-19 and RSV from January 2021 to February 2023 showed large peaks in both infection in children under 3 years old. Children under 5 were shown to have higher rates of RSV, while children over 5 years had higher rates of COVID-19.

RESULTS

42,532 tests COVID-19 were performed, of which 1,139 (2.7%) were positive, 40,469 (95.1%) were negative and 924 (2.2%) were not performed. Children under 1 year old accounted for the highest number of positive tests and children 2-3 years old were the lowest age group effected. 12,592 RSV tests were performed, of which 1,247 (9.9%) were positive, 11,012 (87.5%) were negative and 333 (2.6%) were not performed. Children under the age of 1 year were most affected with rates of infection remaining high until 3 years of age. The comparison of COVID-19 and RSV from January 2021 to February 2023 showed large peaks in both infection in children under 3 years old. Children under 5 were shown to have higher rates of RSV, while children over 5 years had higher rates of COVID-19. The implementation of national restrictions between January and June 2021 showed an expected reduction in COVID-19 infections and subsequently a large reduction in RSV infections. Upon easing of restrictions, RSV infections showed a much more dramatic rise than COVID-19 and the peak time of infection was seen in August 2021, much later than the normal winter peak seen. Following this, RSV infections demonstrated prolonged low levels, particularly around the time of normal peak levels in January 2022 and returned to normal seasonal variation with a peak at the expected time of January 2023. This reduction in RSV transmission additionally resulted in a higher median age of infection (1-2 years) than previous years have shown and will result in the increase of a susceptible cohort of children.
COVID infections demonstrated an expected rise following easing of national restrictions in July 2021. However, infection rates were much slower to reduce, possibly due to a smaller reservoir of natural immunity and showed further expected peaks in the winter months of 2021. Furthermore, COVID-19 infections continued to gradually decrease from January 2022. Overall, this data set shows the variability shown in the timing of RSV infections as a subsequent result of COVID-19 infections and national lockdown restrictions. It also highlights the changes in age groups effected by RSV and COVID-19 and the possible interaction these viral interactions may have had in children at this time.

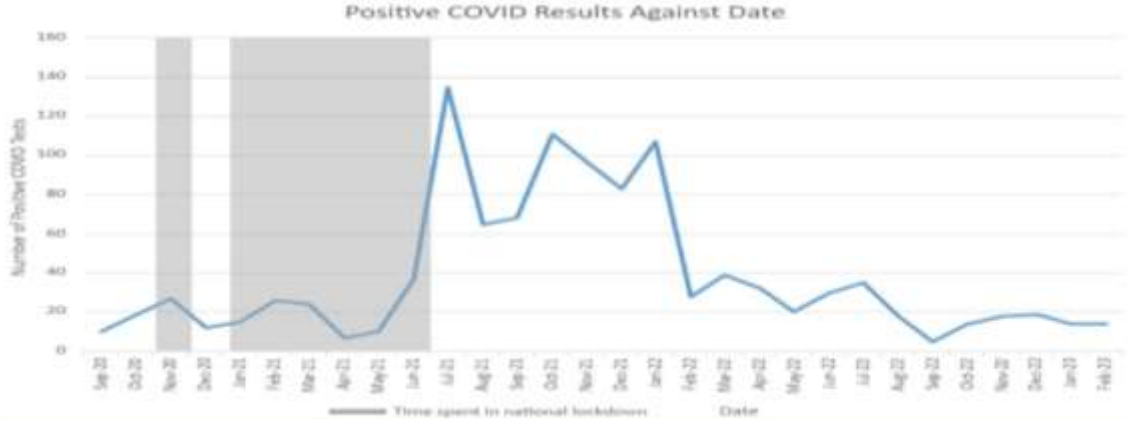

Fig. 1 line graph showing positive COVID tests in blue colour against date in 1 monthly increments from September 2020 to February 2023. The months of time spent in National Lockdown are shown in grey shadowing.

Figure 1 shows the number of positive COVID tests against dates in 1 month increments from September 2020 to February 2023. Lockdowns in the UK are highlighted in grey in 1 monthly increments in November 2020 and from January 2021 to June 2021. The figure highlights the reduction in positive COVID tests during the national lockdown in the UK and the subsequent rise in infections following the easing of restrictions, peaking in July 2021. This was followed by a slow trend of positive COVID tests until February 2023.

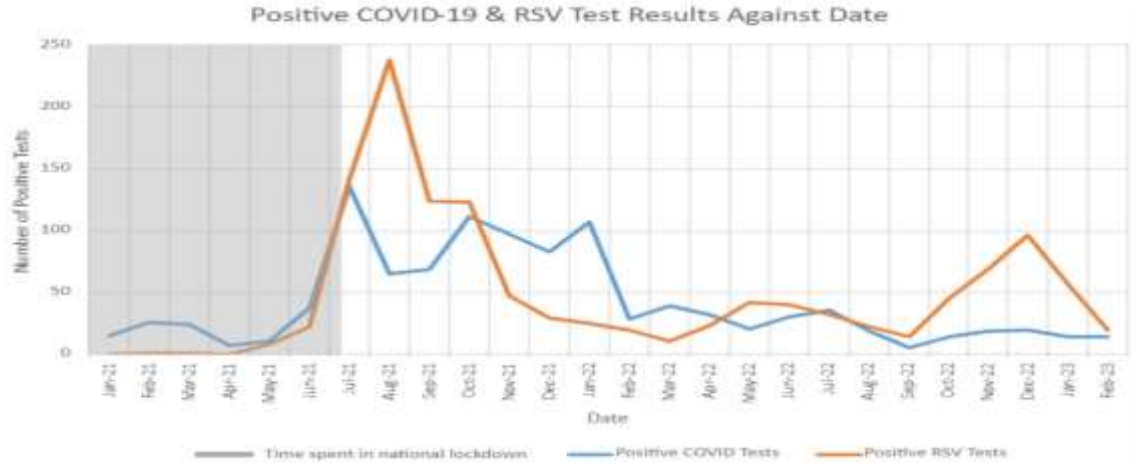

Fig. 2 line graph showing positive COVID-19 and positive RNA tests against date in 1 month increments from January 2021 to February 2023. Positive COVID tests are shown in blue and positive RNA tests are shown in orange. The time spent in national lockdown is shown in grey from January 2021 to early July 2021.

Fig. 2 shows the number of both positive COVID-19 and RSV tests against date in 1 month increments from January 2021 to February 2023. Positive COVID-19 tests are shown in blue and positive RSV tests are shown in Orange. The time spent in lockdown in the UK is shown in grey from January 2021 to early July 2021. The date shows low COVID-19 and RSV tests during lockdown and a subsequent increase in positive tests for both COVID and RSV following the ease of national lockdown. The subsequent rise in positive tests was more pronounced in RSV than in COVID. This was followed by a reduction in both positive COVID and positive RSV tests to February 2023. RSV tests showed a spike in positive testing in December 2022 which is the time of year expected but not in December 2021 which is likely a direct result on national lockdowns.

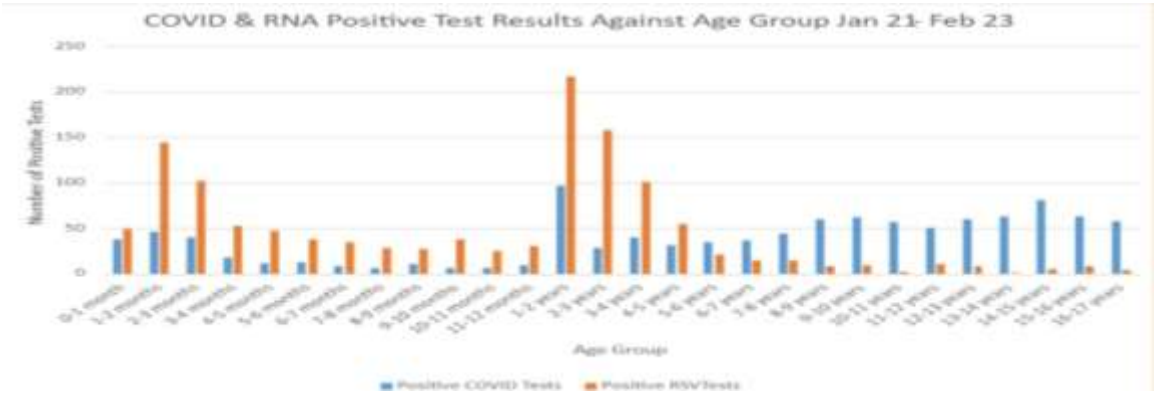

Fig. 3 line graph showing positive COVID-19 and positive RSV tests against age group from January 2021 to February 2023. Age groups are split into 1 month increments below 1 year old and 1-year increments from age 1 to 17 years old. Positive COVID tests are shown in blue and positive RSV tests are shown in orange.

Fig. 3 shows the number of positive COVID and positive RNA tests against age. Age is split into groups of 1 month increments below the age of 1 years old and 1-year increments from ages 1 year to 17 years old. Positive COVID tests are shown in blue and positive RNA tests are shown in orange. The date shows positive RNA tests most affect children from 1 to 3 months old and 1 to 3 years old. This shows an increase in prior to and directly following the median age of 2 years old to contract RSV. Positive COVID-19 tests are evenly distributed from 1 to 19 years with a slight increase in the 1 to 2 years old category.

CONCLUSIONS

Overall, this data set shows the variability shown in the timing of RSV infections as a subsequent result of COVID-19 infections and national lockdown restrictions. It also highlights the changes in age groups affected by RSV and COVID-19 and the possible interaction these viral interactions may have had in children at this time.

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