National Institute for Public Health and the Environment
Ministry of Health, Welfare and Sport

Factsheet RS-virus during COVID-19 pandemic
PIENTER 3 study results

Background

Following social distancing and lockdown interventions to curb the COVID-19 pandemic disease due to respiratory syncytial virus (RSV) infections largely decreased. Lifting these measures resulted in out-of-season RSV activity which has been hypothesized to be caused by declining immunity due to reduced exposure to the virus. We investigated the changes in antibodies to RSV during the COVID-19 interventions up to the out-of-season peak of RSV infection in summer of 2021.

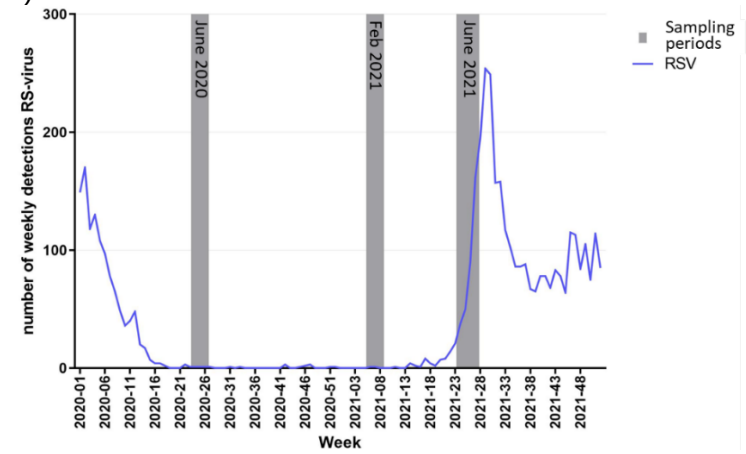
Results

Sera of 558 randomly selected participants of prospective nationwide PIENTER Corona study in the Netherlands for changes in IgG antibody concentrations to the RSV post-fusion F protein. Participants were 1–89 years of age (mean age 48 years) and 42% were male. Samples of the same people were collected in June, 2020 (timepoint 1, several months after the introduction of social restrictions), February, 2021 (timepoint 2, approximately 1 year after the end of the last typical RSV season), and June, 2021 (timepoint 3, the month when social restrictive measures were lifted and the out-of-season RSV epidemic started; figure 1A).

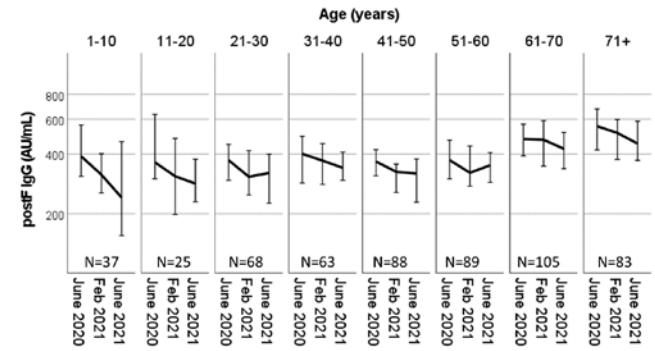
At baseline (timepoint 1, 2020) post-fusion F IgG antibody concentrations increased with age ($p<0.001$), in line with a previous reports from the PIENTER 3 study. Post-fusion F IgG levels declined from 2020 to 2021 ($p<0.001$). No significant decrease was observed between timepoints 2 and 3 ($p=0{\cdot}182$). The decrease in antibodies between 2020 and 2021 was significant in all age groups, except for participants aged 31–40 years. We did not find evidence of differences in decay rates between age groups, probably due to insufficient power. We found 9 individuals (1·6%) with antibody boosting of at least two-fold during this period, mainly between timepoints 2 and 3, which is indicative of exposure to the virus. These individuals were all adults of at least 30 years of age, and two adults showed elevated IgG before the increase in clinical reports of RSV infections, that the viral exposures observed in this study occurred in adults and not in infants may indicate that adults contributed to reintroduction of the virus after the COVID-19 measures. Individuals that showed post-fusion IgG boosting had lower IgG concentrations at baseline (2020, $p=0.028$) compared to those not showing a boost in IgG levels.

Figure 1. Changes in IgG levels to the RSV Fusion protein from 2020 to 2021 relative to notification of RSV infections. A) Weekly RSV surveillance of the Dutch Working Group for Clinical Virology of the Dutch Society for Medical Microbiology (NVMM) and RIVM (blue line) and sampling periods in June 2020, February 2021 and June 2021 indicated in grey. B) Median IgG concentrations in the different 10-year age classes of all 558 individuals. The numbers of individuals per age category analyzed is indicated at the bottom. General linear models for repeated measurements was used on log10-transfomed data to test the decay of antibodies over time ($p<0.001$), for all age groups except age 31-40 years, and differences between age groups ($p<0.001$). C) Individuals showing a ≥2-fold increase in RSV-specific IgG from 2020 to 2021. D) Stratification of persons showing an increase in IgG of ≥2-fold ($n=9$, green), indicative for exposure to the virus, or not ($n=549$, blue). Difference in antibody levels between the 2 groups in 2020 was assessed using Student's T test on log10-transformed concentrations. Boxplot shows median and quartiles, indicate outliers.*

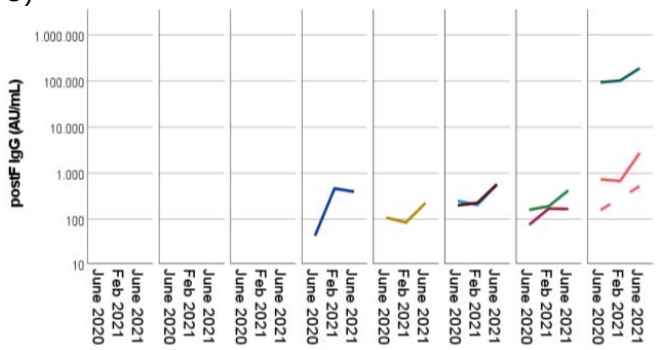
A)


number of weekly detections RS-virus
300
200
100
0
June 2020
Feb 2021
June 2021
Sampling periods
RSV
2020-01
2020-06
2020-11
2020-16
2020-21
2020-26
2020-31
2020-36
2020-41
2020-46
2020-51
2021-03
2021-08
2021-13
2021-18
2021-23
2021-28
2021-33
2021-38
2021-43
2021-48
Week

B)


Age (years)
1-10
11-20
21-30
31-40
41-50
51-60
61-70
71+
posF IgG (AU/mL)
800
600
400
200
N=37
N=25
N=68
N=63
N=88
N=89
N=105
N=83
June 2020
Feb 2021
June 2021

C)


posF IgG (AU/mL)
1.000.000
100.000
10.000
1.000
100
10
June 2020
Feb 2021
June 2021

D)

Conclusion / discussion

These data support the assumption that RSV-specific antibody concentrations declined during the COVID-19 pandemic in all age groups. Despite the observation that IgG levels in persons showing boosting of IgG (indicative of exposure) how IgG levels relate to susceptibility to clinical RSV infection is not clear yet.

Publication

Decline of RSV-specific antibodies during the COVID-19 pandemic.
Den Hartog, van Kasteren PB, Schepp RM, Teirlinck AC, van der Klis FRM, van Binnendijk RS.
The Lancet Infectious Diseases 2023; 31(1):23-25.