



UNIVERSITY OF GRONINGEN
Faculty of Science
Department of Microbiology



SARS-CoV-2 re-infection in The Netherlands

(10)(2e)



Acknowledgements

Medical Microbiology Labs

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Municipal Health Services

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..and several others

RIVM LCI

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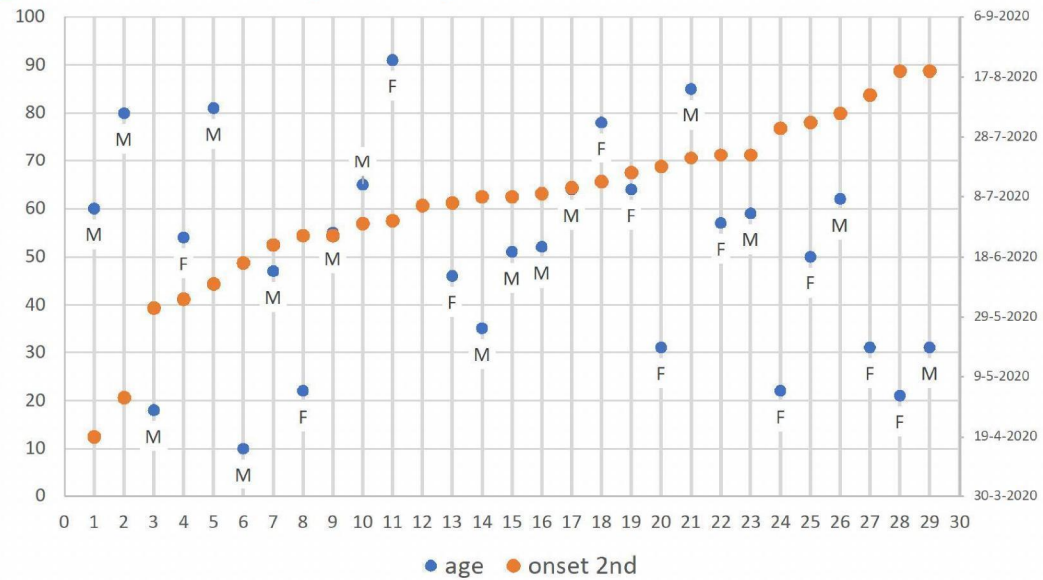
..and several others

RIVM IDS IIV

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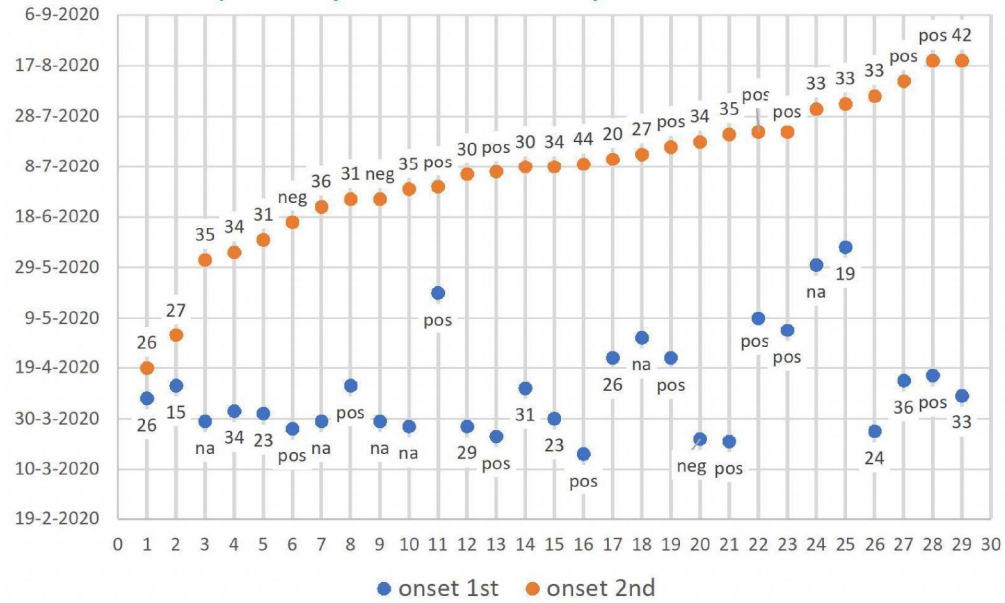


Age and sex of participants



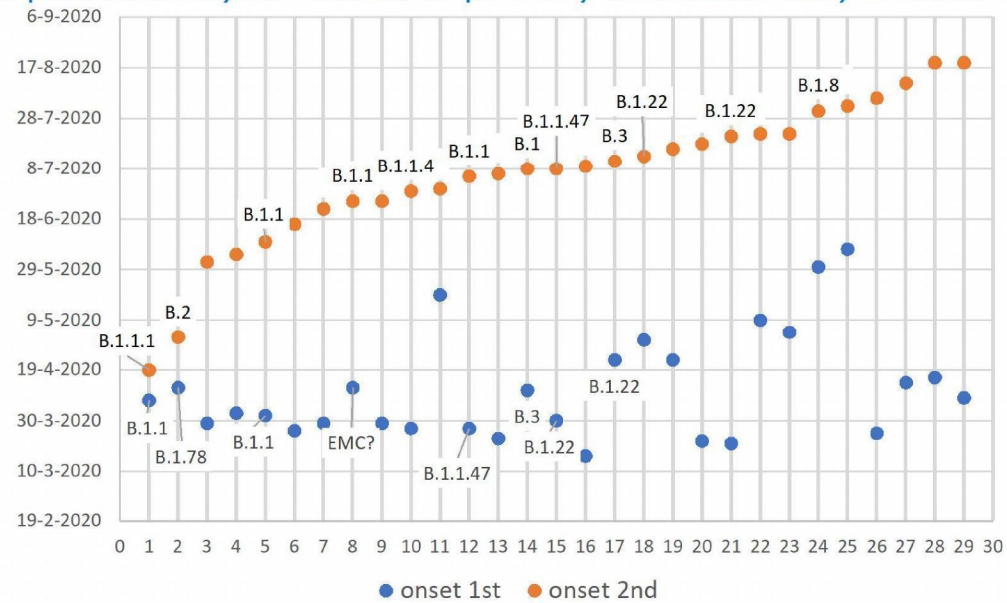


PCR results of primary and secondary infections





Sequence analysis results of primary and secondary infections





Molecular evidence of re-infection; 7 cases

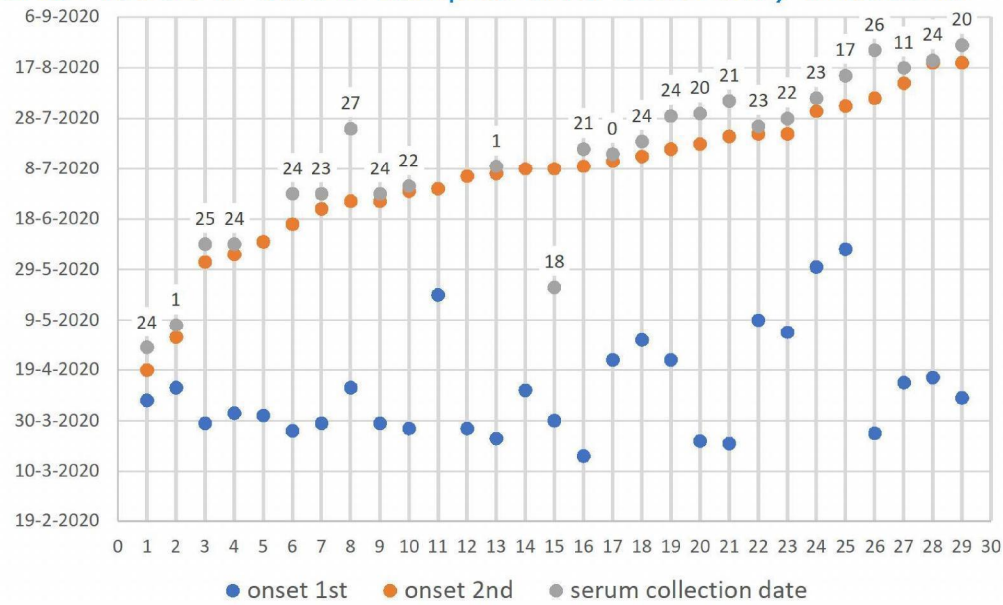
| PCR 1 st date | Ct 1 st | Seq type 1 st | PCR 2 nd date | Ct 2 nd | Seq type 2 nd | days between PCR 1 st and PCR 2 nd |
|--------------------------|--------------------|--------------------------|--------------------------|--------------------|--------------------------|--|
| 14/04/20 | 26 | B.1.1 | 26/04/20 | 26 | B.1.1.1 | 12 |
| 12/04/20 | 15 | B.1.78 | 05/05/20 | 27 | B.2 | 23 |
| 02/04/20 | 23 | B.1.1 | 09/06/20 | 31 | B.1.1 | 68 |
| 27/03/20 | 29 | B.1.1.47 | 05/07/20 | 30 | B.1.1 | 100 |
| 15/04/20 | 31 | B.3 | 10/07/20 | 30 | B.1 | 87 |
| 02/04/20 | 23 | B.1.22 | 11/07/20 | 34 | B.1.1.47 | 99 |
| 24/04/20 | 26 | B.1.22 | 14/07/20 | 20 | B.3 | 81 |

A dynamic nomenclature proposal for SARS-CoV-2 to assist genomic epidemiology

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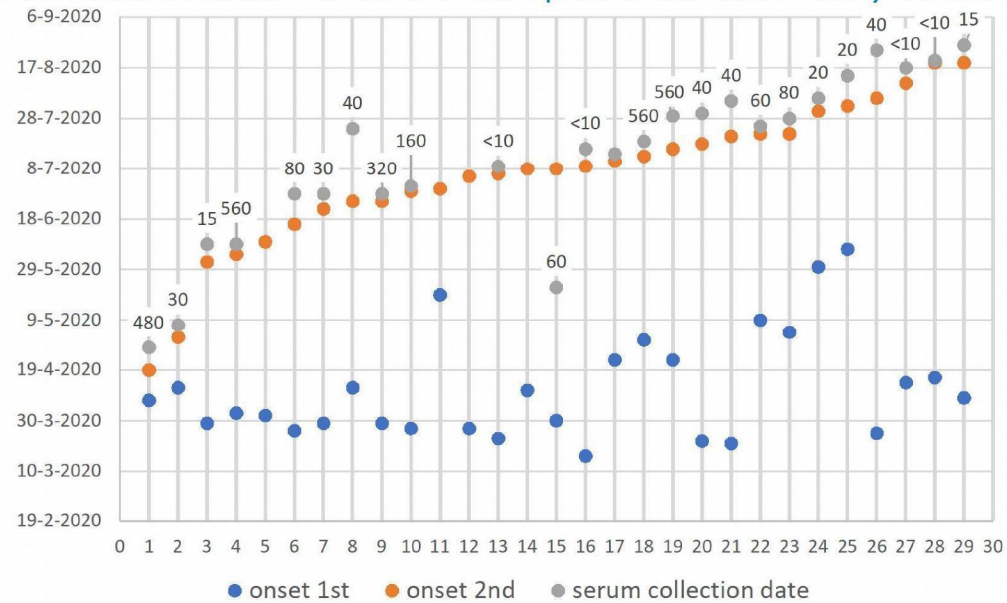


Wantai ratios of serum samples after secondary infections



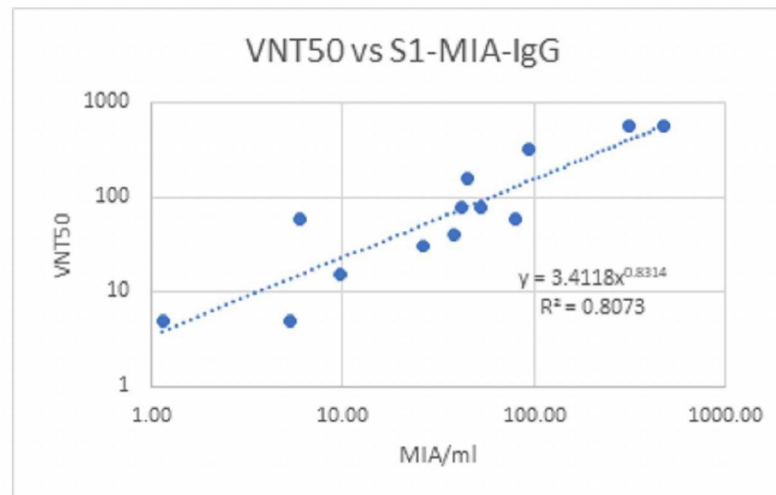


Virus neutralization of serum samples after secondary infections





Serological response after re-infection Multiplex Immunoassay (MIA, Luminex)





Serological evidence of re-infection; part 1

| days between onset 1 and onset 2 | days between onset 2 and serum collection | Wantai ratio | VNT50 | IgG (GMC) S1 | IgG (GMC) RBD | Ai% S1 | Ai% RBD |
|----------------------------------|---|--------------|-------|--------------|---------------|--------|---------|
| 12 | 9 | 24.38 | 480 | 2575.05 | 3063.28 | 18 | 35 |
| 20 | 5 | 0.98 | 30 | 2.60 | 3.95 | 46 | 59 |
| 64 | 7 | 25.24 | 15 | 9.67 | 8.36 | 51 | 63 |
| 63 | 4 | 23.64 | 560 | 480.55 | 1952.06 | 29 | 26 |
| 82 | 12 | 23.52 | 80 | 52.76 | 53.87 | 55 | 58 |
| 85 | 6 | 22.74 | 30 | 26.15 | 19.01 | 39 | 48 |
| 74 | 29 | 27.04 | 40 | 38.43 | 34.38 | 65 | 72 |
| 88 | 3 | 23.53 | 320 | 92.93 | 80.90 | 50 | 67 |
| 94 | 2 | 21.59 | 160 | 45.15 | 51.68 | 58 | 68 |
| 105 | 3 | 0.66 | <10 | 1.14 | 2.00 | | |
| 100 | -47 | 18.46 | 60 | 5.97 | 8.56 | 46 | 45 |
| 115 | 7 | 21.38 | <10 | 5.30 | 5.12 | 51 | 59 |

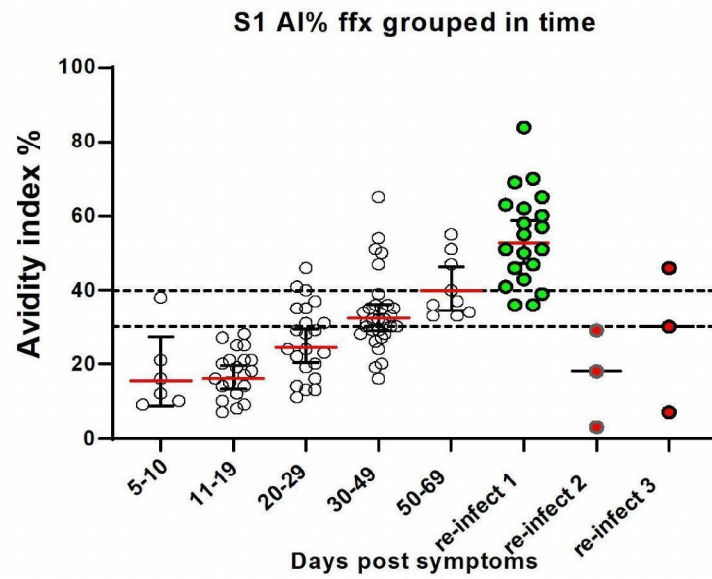


Serological evidence of re-infection; part 2

| days between onset 1 and onset 2 | days between onset 2 and serum collection | Wantai ratio | VNT50 | IgG (GMC) S1 | IgG (GMC) RBD | Ai% S1 | Ai% RBD |
|----------------------------------|---|--------------|-------|--------------|---------------|--------|---------|
| 79 | 3 | 0.02 | | | | | |
| 73 | 6 | 23.74 | 560 | 198.19 | 194.86 | 63 | 79 |
| 84 | 13 | 23.95 | 560 | 315.52 | 751.05 | 57 | 39 |
| 118 | 12 | 19.6 | 40 | 14.53 | 20.06 | 69 | 57 |
| 122 | 14 | 21.19 | 40 | 13.07 | 16.42 | 70 | 73 |
| 74 | 3 | 23.44 | 60 | 79.46 | 271.42 | 47 | 21 |
| 79 | 6 | 22.01 | 80 | 42.18 | 61.40 | 36 | 48 |
| 62 | 5 | 23.38 | 20 | 17.26 | 18.05 | 43 | 80 |
| 57 | 12 | 16.86 | 20 | 12.17 | 11.55 | 41 | 59 |
| 133 | 19 | 26.42 | 40 | 50.45 | 40.35 | 65 | 69 |
| 119 | 6 | 11.11 | <10 | 3.74 | 6.59 | 36 | 32 |
| 125 | 1 | 24 | <10 | 5.63 | 5.48 | 62 | 64 |
| 133 | 7 | 20.41 | 15 | 5.09 | 8.60 | 60 | 45 |



Serological evidence of re-infection; avidity index





Conclusions

- † Twentynine potential re-infection cases investigated by laboratory testing
- † Seven re-infection cases confirmed by sequence analysis
 - Qualitative comparison, not easy to obtain
 - Re-infection with identical virus would not qualify
- † Fourteen re-infection cases confirmed by serological criteria
 - Quantitative criteria:
 - avidity index >50%, <30 days after onset
- † None from the set of 7 occur in the set of 14
- † Four possible re-infection cases; <50% AI, >20 Wantai ratio, <14 days after onset
- † Four are probably not re-infection cases, PCR not confirmed, few samples available, no serological response after onset of symptoms