

Cluster of coronavirus disease 2019 (Covid-19) in the French Alps, 2020

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Accepted Manuscript

Summary: In this cluster, 12 Covid-19 cases (one asymptomatic) were linked to one single index case. One child, co-infected with other respiratory viruses, attended three schools while symptomatic, but did not transmit the virus, suggesting potential different transmission dynamics in children.

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Abstract

Background: On 07/02/2020, French Health authorities were informed of a confirmed case of SARS-CoV-2 coronavirus in an Englishman infected in Singapore who had recently stayed in a chalet in the French Alps. We conducted an investigation to identify secondary cases and interrupt transmission.

Methods: We defined as a confirmed case a person linked to the chalet with a positive RT-PCR sample for SARS-CoV-2.

Results: The index case stayed 4 days in the chalet with 10 English tourists and a family of 5 French residents; SARS-CoV-2 was detected in 5 individuals in France, 6 in England (including the index case), and 1 in Spain (overall attack rate in the chalet: 75%). One pediatric case, with picornavirus and influenza A coinfection, visited 3 different schools while symptomatic. One case was asymptomatic, with similar viral load as that of a symptomatic case. Seven days after the first cases were diagnosed, one tertiary case was detected in a symptomatic patient with a positive endotracheal aspirate; all previous and concurrent nasopharyngeal specimens were negative. Additionally, 172 contacts were monitored, including 73 tested negative for SARS-CoV-2.

Conclusions: The occurrence in this cluster of one asymptomatic case with similar viral load as a symptomatic patient, suggests transmission potential of asymptomatic individuals. The fact that an infected child did not transmit the disease despite close interactions within schools suggests potential different transmission dynamics in children. Finally, the dissociation between upper and lower respiratory tract results underscores the need for close monitoring of the clinical evolution of suspect Covid-19 cases.

Key-words: coronavirus, SARS-CoV-2, Covid-19, cluster, infection

Introduction

A novel coronavirus (severe acute respiratory syndrome coronavirus 2, SARS-CoV-2) causing respiratory infections (coronavirus disease 2019, Covid-19) was first detected in Wuhan, China in December 2019 (1-3). Within weeks, the virus spread to all provinces of China, and to a growing number of countries in five continents (China accounting for >99% of cases) (4-5). The first reported case series featured a high proportion of severe disease (acute respiratory distress syndrome in 17-29% of the cases) (6-7). On 24/01/2020, the first 3 confirmed Covid-19 cases were detected in France, being the first reported in Europe (8-9); as of 07/02/2020, a total of 6 cases had been detected: 4 among individuals coming or returning from China and 2 among non-travelers in contact with cases in France.

On 07/02/2020, the French health authorities were informed via the European Early Warning and Response System (EWRS) of a confirmed Covid-19 case in the United-Kingdom on 06/02/2020, and who had recently stayed in France. During 18/01-23/01/2020, the index case had attended a conference in Singapore linked to Covid-19 confirmed cases, the first of whom was from Wuhan, China. On 24/01/2020, he flew from London to Geneva for a skiing holiday in France. He stayed for one night in Saint-Gervais-les-Bains, Haute-Savoie and then in a chalet in the ski resort of Contamines-Montjoie, Haute-Savoie. On 28/01/2020, he flew back to the UK from Geneva. He developed moderate symptoms during the night of 24/01/2020 and was symptomatic during the rest of his stay in France. On 07/02/2020, we initiated an investigation to detect potential secondary Covid-19 cases, identify their contacts and prevent transmission.

Methods

Case definitions

In accordance with the 07/02/2020 surveillance case definition (10), we defined as a confirmed case a person with a positive SARS-CoV-2 RT-PCR on respiratory samples and a direct or indirect epidemiological link with the chalet in Contamines-Montjoie. A possible case was a patient with an acute respiratory illness, whatever the severity, and a direct or indirect epidemiological link with a confirmed case from the chalet.

Contact tracing and data collection

Confirmed cases were interviewed using bespoke questionnaires on exposure and clinical history, clinical characteristics and their contacts during the period of their clinical symptoms. Depending on the level of risk, we defined contacts as high/moderate, low, or negligible risk, as previously reported (8). As per the French national guidance for contacts of Covid-19 cases (8), low risk contacts were asked to measure their body temperature twice a day during a 14-day period after their last exposure, and, in case of fever or respiratory symptoms to wear a surgical mask and contact the emergency hotline (*SAMU-centre15*). In addition, high/moderate risk contacts were isolated at home, and were actively followed up through daily calls.

Laboratory methods

Respiratory samples were either nasopharyngeal swabs (upper respiratory tract) (Sigma Virocult®, Medical Wire Instrument, UK) and endotracheal aspirates (lower respiratory tract). All samples were refrigerated and shipped to the National Reference Center for Respiratory Viruses (Hospices Civils de Lyon), where they were tested for SARS-CoV-2, but also for other respiratory pathogens. Details of the procedures of RNA extraction and real-time RT-PCR (rtRT-PCR) and of the viral load calculation are presented in the supplementary material.

Ethical considerations

Investigations complied with the General Data Protection Regulation (Regulation (EU) 2016/679 and Directive 95/46/EC) and the French data protection law (Law n°78-17 on 06/01/1978 and Décret n°2019-536 on 29/05/2019). Informed consent to disclose information relevant to this publication was obtained from the confirmed cases in France.

Results

Cases and contacts in the chalet (Les Contamines-Montjoie)

During 25/1-28/1, the index case stayed in the chalet with 10 other adult British tourists (apartment 1) and a British family of 2 adults and 3 children, residents in France (apartment 2) (Figure 1). Of these, 5 tested positive for SARS-CoV-2 in France, 6 were found positive in the UK (including the index case), and one in Spain, indicating an overall attack rate of 75% (12/16) among the tourists/residents in those apartments, 82% (9/11) in apartment 1, and 60% (3/5) in apartment 2) (Figure 1-2). In addition, 5 other adult British tourists arrived in apartment 1 of the chalet after the index case had left (high risk contacts of the secondary

cases). On 07/02, four of those adult British tourists in apartment 1 and the two children of the family in apartment 2 were isolated in hospitals; one adult tourist had left for the UK before 07/02 and was followed up there. On 15/02, one of those adult tourists tested positive while being in hospital isolation in France; he had stayed in apartment 1 of the chalet together with three secondary cases (tertiary case). All cases were adults, apart from one 9 years old child who attended three different schools (school A, B, C) and one ski class while symptomatic. Of all cases, 75% were males. The dates of onset of symptoms of the confirmed cases, excluding the index case, ranged from 27/01 to 12/02 (Figure 2).

Clinical characteristics and management of case diagnosed in France (n=6)

Of all 6 confirmed cases diagnosed in France, case 4 did not develop any sign or symptom, apart from muscle pain on 27/1/2020 following intense sport activities. Among the other 5 symptomatic confirmed cases, the following signs and symptoms were reported: fever (n=5), dry cough (n=5), wet cough (n=1), asthenia/fatigue (n=3), chills (n=2), sweats (n=2), rhinorrhea (n=3), and myalgia (n=1); four cases had those mild signs/symptoms one week before the first positive test on 07/02 (Figure 3-4). At the time of diagnosis, they had these symptoms with an even lower intensity, and all had a benign clinical evolution. Case 13, a high-risk contact initially negative for SARS-CoV-2, developed fever and cough with respiratory crackles at auscultation on the fifth day of hospital isolation. A bilateral interstitial syndrome was identified at the CT-scan with bilateral ground-glass opacification predominating on the left. The symptoms of all cases resolved rapidly, without anti-viral treatment.

Virological findings of cases

All 5 symptomatic confirmed cases were first tested between 6 to 10 days after symptoms onset. For 4 cases, a low viral load detected (often under the limit of quantification of $1 \log_{10}$ copies/1000 cells) (Figure 3-4). All confirmed cases stopped viral excretion within 17 days after onset of illness (median 11 days; range 5-17) (Figure 4). Case 4, the asymptomatic case, had the same natural history of viral excretion as symptomatic case 3 with a viral shedding of 7 and 6 days respectively. Cases 2 and 6 (child) had similar shedding patterns, with virus load close to the limit of quantification for several days before being negative, much lower than those observed in cases 3 and 4. Case 13 had an endotracheal aspirate (ETA) positive at D4 with SARS-CoV-2 (viral load of $2.4 \log_{10}$ copies/1000 cells), while negative in the nasopharyngeal swabs (NPS) collected since admission (8 days). The NPS of the same day and the following days remained negative. The daily follow-up revealed a short-lasting excretion with only two successive ETA with a lower viral load ($2.4 \log_{10}$ and $1.1 \log_{10}$ copies/ 1000 cells, respectively, Figure 4), the subsequent ETA remained negative. All cases were negative for other viruses except for the pediatric case, who had a SARS-CoV-2 + picornavirus (rhinovirus or enterovirus) + influenza A(H1N1)pdm09 co-infection. His two siblings were negative for the SARS-CoV-2, but had an Influenza A(H1N1)pdm09 infection, and an Influenza A(H1N1)pdm09 + picornavirus co-infection.

Control measures and contact tracing activities in France

Because of the large number of contacts of the pediatric case (case 6), particular attention was paid to detect tertiary cases in children in the three schools the child attended while symptomatic. On 08/02, a public meeting was held to inform the parents of two schools (A and B); the parents of school C were informed by telephone. As a precaution, the first two schools were closed for two weeks and the third for one week (end of follow-up period; the pediatric case visited that school on 31/01). On Sunday 09/02, infectious disease specialists

and epidemiologists evaluated the risk of 112 school contacts. All children and teachers who were in the same class as the symptomatic pediatric case were considered as high risk contacts and were isolated at home (Table 2). All hospitals in the region implemented emergency plans to accommodate potential tertiary cases.

Overall, 172 contacts were identified; 84 (49%) were classified as high/moderate risk and 88 (51%) as low risk (Table 1). Of those, 98% (n=169) were contacted; 70 (41%) had respiratory symptoms during the investigation and were thus classified as possible cases; 73 were tested; all tested negative for SARS-CoV-2 except for case 13 who tested positive during hospitalization. No additional cases were identified within the 14-day follow-up period of all the contacts. The movement history of the confirmed cases during their stay in France and their contact tracing is presented in the Supplementary material. Briefly, contacts of the other 5 cases that were monitored included teachers in another school, apartment staff and cleaners, staff in shops and restaurants, and passengers in four buses and three airplanes.

Except for case 13 (tertiary case), no SARS-CoV-2 virus was detected in any of the contacts monitored. However, other seasonal respiratory viruses were detected in 64% (n=46) of the tested contacts, representing 62% and 67% of high and low risk contacts, respectively (Table 1). Overall, 33% of the viral infections detected were due to influenza (75% of influenza A (H1N1)pdm09 virus and 25% of influenza B virus) and 18% were due to a picornavirus (rhinovirus or enterovirus). At school C, 30% (3/10) of contacts of the pediatric case had a picornavirus infection (Table 1). In addition, “classical” human coronaviruses such as HUK1 and NL63 were detected in 16% of contacts without any cross reactivity with SARS-CoV-2 molecular diagnostics.

Discussion

In this international community cluster, all cases, but one (tertiary case), were high risk contacts of the index case, indicating that one case may have infected 11 other individuals. Transmission occurred only within the environment of the chalet, where the attack rate was very high. Studies suggested that the basic reproductive number (R_0) for Covid-19 ranges between 2-3 (2,12). Although estimates and confidence intervals around those estimates may differ, the observed R_0 in this cluster was at least 3 times higher, suggesting a possible “super spreading” event. Several “super spreading” events occurred during other emerging coronavirus outbreaks, such as the outbreaks of the Middle East respiratory syndrome (MERS-CoV) in 2015, and severe acute respiratory syndrome coronavirus (SARS-CoV) in 2003 (13). SARS-CoV and SARS-CoV-2 share the same cell receptor, human angiotensin-converting enzyme 2 (hACE2) (14); as the expression of hACE2 is more important in the pneumocytes and lower airways epithelia, cases with pneumonia and/or bronchitis may both produce and (by cough or sneezing) disseminate more efficiently the virus (15). Given their high propensity to spread infection, super-spreaders probably shed larger amounts of pathogen and for a longer period of time (16). A complex combination of factors, including the host, the virus, the behavior of individuals and the environment (proximity and air flow dynamics), all likely play a role in the number of subsequent infections initiating from a single super-spreader (17). A thorough study of those factors and environmental dynamics will be important to delineate their relative contribution to the phenomenon of super-spreading.

As the majority of persons present in the chalet on 07/02 reported current or previous respiratory symptoms, they were all hospitalized and tested for SARS-CoV-2. Following several detailed interviews, it was confirmed that one case did not develop any symptoms. Anecdotal reports suggest the occurrence of asymptomatic cases of Covid-19. In recently published reports, SARS-CoV-2 was detected in asymptomatic travelers returning to

Germany from China (18) and in asymptomatic family members in two family clusters in China (19-20). The possibility of transmission from an asymptomatic individual is not clear. Recently published reports suggested potential transmission during the incubation period of the index patients (21-22). In line with another recently published study (23), our study indicated that an asymptomatic individual had similar viral load as a symptomatic case, both at low levels, suggesting a transmission potential of asymptomatic or minimally symptomatic cases. To confirm this finding, we used quantitative and normalization methods, to allow valid comparisons of the different specimens. As our tertiary case was exposed to two symptomatic and one asymptomatic case in apartment 1 of the chalet, it was not possible to disentangle who of those was the source of infection. However, given that the virus can remain viable and infectious on surfaces up to days, environmental contamination via the index case cannot be excluded (24). Future seroprevalence studies will be warranted to estimate the prevalence of asymptomatic infections, and household and viral shedding studies to determine the transmission dynamics of asymptomatic individuals (25).

All symptomatic cases of this cluster treated in France initially presented with mild respiratory symptoms and none of them showed signs of severe clinical illness. This mild clinical picture contrasts with the first reports of Covid-19 cases series, which featured a high proportion of severe pneumonia and a considerable case-fatality (6-7). This indicates that the proportion of mild SARS-CoV-2 may be higher than initially suspected. In our cluster, cases could continue their activities, including skiing (and schooling for the child) while symptomatic, and interacted with many other individuals, increasing possibilities for transmission. Despite those interactions, only one tertiary case was detected and linked to the chalet. It is unlikely that we missed symptomatic cases, as we monitored and tested all contacts that developed symptoms during the 14-day follow up period. However, we may have missed asymptomatic cases.

Particularly, the infected child, despite interactions with a large number of contacts in different schools, did not transmit the disease, as evidenced by the large number of negative results of his tested contacts. However, the high proportion of picornavirus and influenza infections among his contacts at the schools indicated transmission of those viruses within those settings. Similarly, we observed that the family cluster allowed the dissemination of picornaviruses or influenza A viruses in the 3 children, while SARS-CoV-2 was detected in only one child. These two observations suggest that picornavirus and influenza infections are more easily transmitted than SARS-CoV-2. It is possible that viral interference in the host may impact the individual susceptibility to another viral respiratory infection as observed during the 2009 influenza pandemic and other winter seasons between A(H1N1) influenza virus and RSV (26-27). It is also possible that the very low viral load of the pediatric case and the subsequent lack of transmission might be related to his co-infection and the co-circulation of respiratory viruses. Viral load was only tested 8 days after his onset of symptoms. The child continued his normal activities and interactions as his symptoms were mild. Current evidence indicates that children develop Covid-19 less often than adults and the clinical manifestations of the disease are milder (28-30). The above suggest that children, being less likely to be infected and more likely to develop mild disease, may play a less important role in the transmission of this novel virus.

The tertiary case has been regularly screened for SARS-CoV2 infection through the testing of nasopharyngeal specimens. Following the development of fever and dry cough and abnormalities in the CT scan, two endotracheal aspirates collected on two consecutive days were positive for the SARS-CoV-2. However, the nasopharyngeal swabs collected on the same days remained negative. Earlier reports noted a higher detection rate in lower respiratory tract specimens, than upper respiratory tract specimens (31). This dissociation between upper and lower respiratory tract results has been recently documented and may be related with compartmentalization of infection along time, and with the virus receptor

distribution discussed earlier (14-15, 31-33). Most of screening strategies rely on upper respiratory tract specimens only. This case suggests that some clinical presentations may be limited to lower respiratory tract infection, not necessarily severe. In our case, only two successive specimens were positive, with a low viral load. This suggests an unlikely risk of transmission, but a risk of missed diagnosis if lower respiratory tract specimens are not screened in suspected cases with signs of lower respiratory tract infection.

This cluster occurred during the winter season. As the case definition was sensitive, the proportion of possible cases in contacts with respiratory signs/symptoms was high. Of those, 64% tested positive for other respiratory viruses circulating in the community during this winter period. Due to public anxiety, many parents asked for a screening test to exclude the possibility of Covid-19 among their children. However, following the surveillance protocol, health professionals mostly tested symptomatic individuals who met the case definition of a possible case. Rapid and accurate risk communication targeting the contacts of the cases and the general public of the skiing resort were crucial for the management of this outbreak.

No further tertiary cases were detected within the 14-day follow-up period of the numerous contacts, indicating that this transmission chain was successfully interrupted. This investigation required collaboration with the health authorities of five different countries (France, UK, Spain, Switzerland and Australia) with the support of EWRS and International Health Regulations (IHR) national focal points, underlying the added value of international notification systems. The subsequent generation of cases was detected within 24 hours after the initial notification and an extensive contact tracing exercise was rolled out on the next day, requiring quick and coordinated mobilization of approximately one hundred professionals during the weekend and the collaboration of multidisciplinary teams at the local and national level. Preparedness following the experience of previous emerging disease

outbreaks, such as SARS, MERS-CoV, A(H1N1)pdm09 and Ebola, facilitated a quick and coordinated response (8).

Despite extensive contact tracing, some contacts were either impossible to trace (e.g. people sharing ski cabins or lifts, co-travelers in public transportations who did not book their tickets online) or evaluated as negligible because of short and/or distant contacts (e.g. casual contacts). Accidental events at risk of transmission in such occasions, such as an episode of cough or sneezing, cannot be ruled out.

Conclusions

The investigation of this cluster of Covid-19 in France indicated the occurrence of one asymptomatic infection with similar viral load as a symptomatic case, suggesting a transmission potential of asymptomatic cases. The occurrence of a case in a child, co-infected with other respiratory viruses, who did not transmit the disease despite interactions with his classmates suggest that children might not be an important source of transmission of this novel virus. The potential dissociation between upper and lower respiratory tract results underscore the need for close monitoring of the clinical evolution and screening of the suspected COVID-19 cases. Finally, preparation, international collaboration and early warning and response systems, and a multidisciplinary approach are essential elements for the effective management of and quick response to emerging infectious diseases.

Authors' contributions

KD, OE, TB, AG wrote the first draft of the manuscript.

KD, TB, SC, GS, AM, ZB,JB,SV, EF,AT, RV, DL, BC, CS were involved in the epidemiological investigation and contact tracing activities.

AG, BDM, BL did the microbiological analysis.

OE, EBN, FA, CL, EF, VT, FB, CC were involved in the clinical management of the cases, the evaluation of the risk of the contacts and the analysis and the interpretation of clinical data.

All authors revised and approved the manuscript.

Acknowledgements: We would like to thank all the patients and all the multiple actors that contributed to this investigation. As this was a response to an urgent public health event, an Ethics committee approval was not needed.

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Destrem, Margaux Isnard, Thibault Challan-Belval, Chloe Wackenheim, Alice Couturier, Gael Gheno, Thierry Roupioz, Nicolas Lucet, Stéphane Ayouni, Mireille Vincent, Servicio de Epidemiología, Dirección General de Salud Pública del Gover Balear; Masserey Virginie, Bourquin Catherine Bag

Role of funding source

All authors are employees of publicly funded institutes. There was no external funding for this work. All authors were responsible for the interpretation of the findings and the writing of the report.

Conflict of interest: None declared

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Table 1. Number of high risk and low risk contacts and virological results for respiratory viruses, Contamines-Montjoie, France, January-February 2020

	Risk category	Contacts n	Contacted n (%*)	Possible cases n (%*)	Sampled n (%*)	SARS-CoV-2 n (%†)	Adenovirus n(%†)	Human Coronavirus n (%†)	Influenza n (%†)	Parainflu. n (%†)	Picornavirus n (%†)
School A	High risk	31	31 (100%)	18 (58%)	19 (61%) ^{††}	0 (0%)	0 (0%)	6 (32%) 2 HKU1, 4 NL63	6 (32%) 3 IAV, 3 IBV	3 (16%) 3 PIV2	3 (16%)
	Low risk	24	24 (100%)	23 (96%)	23 (96%)	0 (0%)	1 (4%)	2 (9%) 2 HKU1	11 (48%) 10 IAV, 1 IBV	1 (4%) 1 PIV2	3 (13%)
School B	High risk	5	5 (100%)	2 (40%)	2 (40%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Low risk	0	-	-	-	-	-	-	-	-	-
School C	High risk	25	25 (100%)	10 (40%)	10 (40%)	0 (0%)	0 (0%)	0(0%)	3 (30%) 1 IAV, 2IBV	0 (0%)	3 (30%)
	Low risk	1	1 (100%)	1 (100%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
Ski-club	High risk	5	5 (100%)	0 (0%)	0 (0%)	-	-	-	-	-	-
	Low risk	11	10 (100%)	0 (0%)	0 (0%)	-	-	-	-	-	-
Other community contacts	High risk	12	11 (92%)	8 (67%)	8 (67%)	0 (0%)	1 (13%)	2 (25%), 1 HKU1, 1 NL63	2 (25%) 2 IAV	0 (0%)	1 (13%)
	Low risk	52	51 (98%)	4 (8%)	4 (8%)	0 (0%)	0 (0%)	1 (25 %)	0 (0%)	2 (50%)	1 (25%)

								1 NL63	1 PIV2		
Hospitalized contacts &	High risk	6	6 (100%)	4 (67%)	6 (100%)	1 (17%)	0 (0%)	1 (17%)	2 (33%)	0 (0%)	1 (17%)
								1 HKU1	2 IAV		
	Low risk	0	-	-	-	-	-	-	-	-	-
Total		172	168 (98%)	70 (40%)	73 (42%)^{††}	1 (1%)	2 (3%)	12 (16%)	24 (33%)	6 (8 %)	13 (18%)

*per 100 contacts; †per 100 contacts sampled; ††one or more asymptomatic contacts was tested, & contacts of the chalet, hospitalized for isolation and systematically tested.

Abbreviations: HKU, coronavirus HKU; NL 63, Human coronavirus NL63; IAV, influenza virus A; IBV, influenza virus B, HKU1; PIV2, parainfluenza virus B

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Figure 1. Cluster of Covid-19, Contamines-Montjoie, France, January-February 2020

Figure 2. Temporal relation between Covid-19 cases in the chalet and onset of symptoms of cases, Contamines-Montjoie, France, January-February 2020*

*Cases 2-6 were first tested on 07/02/2020 and were diagnosed positive on the same day.

Figure 3. Normalised viral loads and symptoms of confirmed Covid-19 cases by day since onset of symptoms, Contamines-Montjoie, France, January-February 2020

Case 2 to 6: all virological data were obtained from nasopharyngeal swabs. Case 4 was asymptomatic; for visual purposes, we arbitrarily assigned 31-January as D1, as it was the median of the days of onset of the other (symptomatic) cases. Case 13: virological data were obtained from endotracheal aspirates (ETA), all nasopharyngeal swabs being negative (before or during the period of positive ETA).

All viral load are expressed as $\log_{10}(\text{copies}/1\ 000\ \text{cells})$. Results below the quantification limit are positive but non quantifiable.

*: D1 correspond to the date of Covid-19 symptoms onset

Figure 4: Duration of symptoms and virological results for the 6 confirmed Covid-19 cases in France and their contacts in the chalet in Contamines-Montjoie, January-February 2020

■ Symptomatic period for each confirmed case and contact / ■ Patient in the UK / →: hospital discharge

All virological data were obtained from nasopharyngeal swabs, unless specified. *: results on endotracheal aspirates

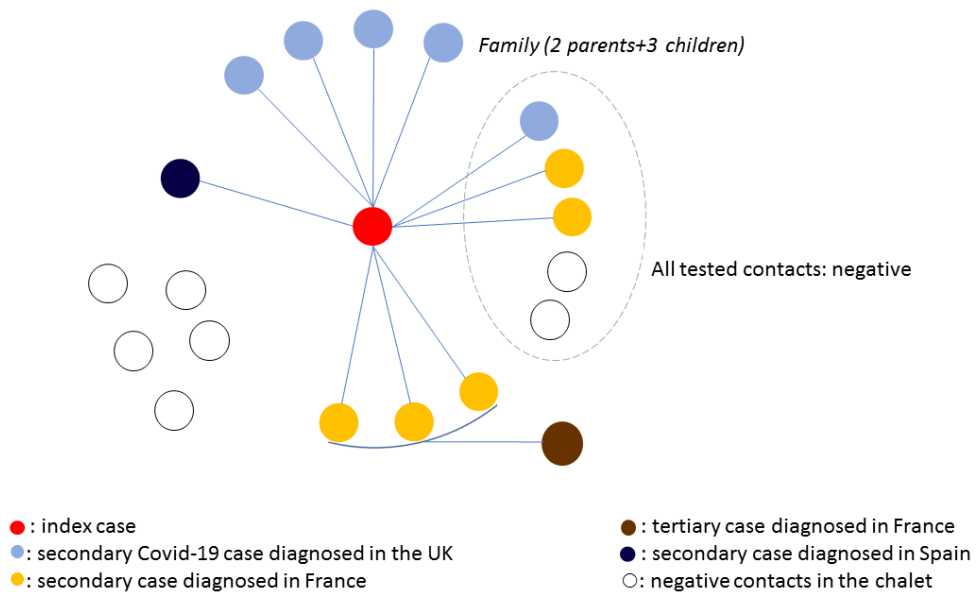
Virological data are represented by +: positive and quantified, + NQ: positive but not quantifiable, -: negative, *nd*: not determined.

On 7 Feb, all cases and contacts were tested for other respiratory viruses; on 13 Feb, case 13 was retested for other respiratory viruses.

All cases and contacts from the two apartments were discharged from hospital except for contact 3 who had contact with case 13 during hospitalisation.

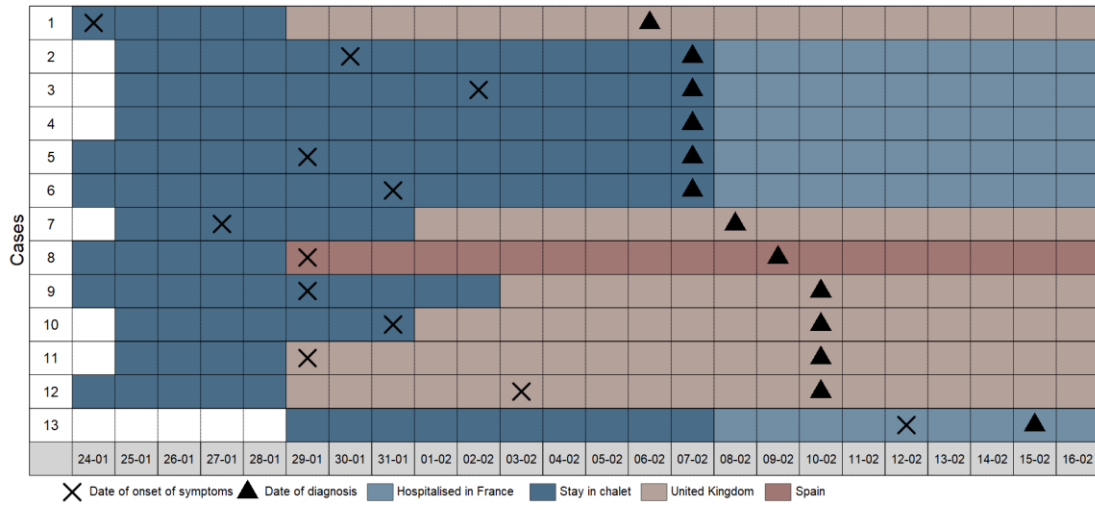
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Figure 1



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Figure 2



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Figure 3

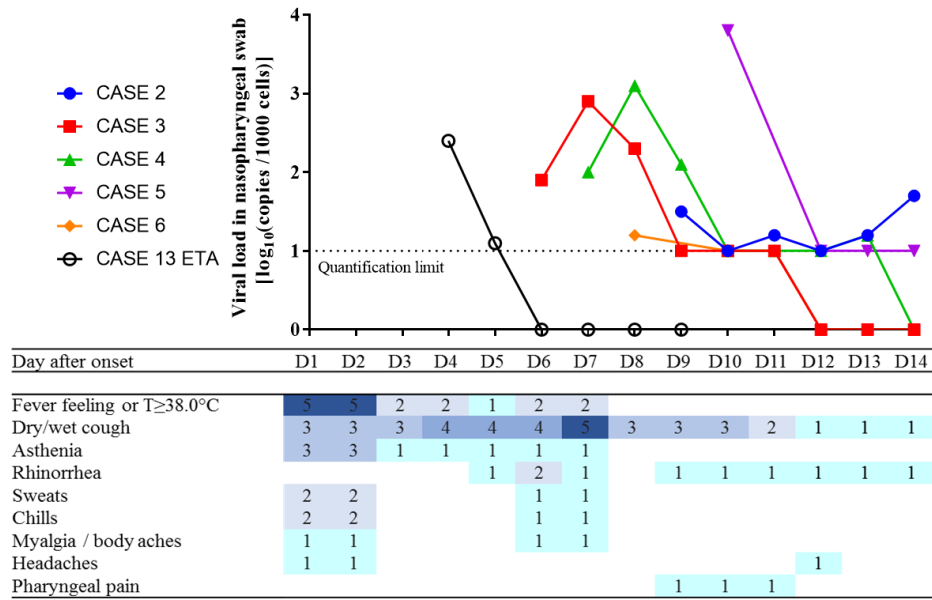


Figure 4

Cases or contacts	STATUS	Other viruses detected on diagnostic day	28-Jan	29-Jan	30-Jan	31-Jan	1-Feb	2-Feb	3-Feb	4-Feb	5-Feb	6-Feb	7-Feb	8-Feb	9-Feb	10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb	17-Feb	18-Feb	19-Feb	20-Feb	21-Feb	22-Feb	
Index	Confirmed case	nd																											
Case 2	Confirmed case	NEG												+	+ NQ	+	+ NQ	+	+	-	-	-	-	-	-	-	-	→	
Case 3	Confirmed case	NEG												+	+	+	+ NQ	+ NQ	+	-	-	-	-	nd	-	-	-	-	
Case 4	Confirmed case	NEG												+	+	+	+ NQ	+ NQ	+	+	-	nd	-	-	→				
Case 5	Confirmed case	NEG												+	nd	+ NQ	+ NQ	+ NQ	+ NQ	-	+ NQ	-	nd	→					
Case 6	Confirmed case	Ricornaviruses and Influenza virus A												+	nd	+	+ NQ	-	-	-	nd	nd	→						
Case 13	Confirmed case	NEG												-	-	-	-	nd	-	-	-	+	+	-	-	-	-	-	→
Contact 1	Contacts	NEG												-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	→
Contact 2	Contacts	Coronavirus HKU1												-	-	nd	-	nd	nd	nd	nd	nd	nd	-	→				
Contact 3	Contacts	NEG												-	-	nd	-	nd	-	-	-	-	nd	-	nd	-	nd	-	nd
Contact 4	Contacts	Ricornaviruses and Influenza virus A												-	-	nd	-	nd	nd	nd	nd	nd	nd	-	→				
Contact 5	Contacts	Influenza virus A												-	-	nd	-	nd	nd	nd	nd	nd	nd	-	→				

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