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COVID-19 symptom surveillance in immunocompromised children and young people

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COVID-19 symptom surveillance in immunocompromised children and young people

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On behalf of the ImmunoCOVID19 study group (a full list of co-authors is provided in Supplementary Online Appendix A)

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ABSTRACT

Objectives: To assess the frequency and severity of SARS-CoV-2 infection in immunocompromised children and young people in the United Kingdom during the SARS-CoV-2 pandemic.

Design: A prospective observational cohort study.

Setting: 46 centres across the United Kingdom between 16th March and 4th July 2020. A weekly online questionnaire based on the ISARIC-WHO Case Report Form was used to collect participant reported data on symptoms, test results, NHS attendance, hospital admission and impact on daily life.

Participants: 1490 immunocompromised children, defined as those requiring an annual influenza vaccination due to their underlying condition or medication.
Main outcome measures: Incidence of SARS-CoV-2 infection, incidence of SARS-CoV-2 related symptoms and impact on health services and wellbeing.

Results: The median age was 11 years (range 0 – 18 years), 54.4% were female. The most common primary diagnoses were rheumatological (41.1%),

immunodeficiency (7.9%) and solid organ or bone marrow transplant diagnoses (6%). Methotrexate (25.9%), anti-TNF therapy (20.3%) and corticosteroids (16.7%) were most commonly prescribed. 922 (67.4%) participants reported at least one symptom consistent with suspected SARS-CoV-2 infection over the study period. 476 (34.8%) reported three or more symptoms. 110 symptomatic participants underwent a test for SARS-CoV-2. All were negative. The frequency of cough, blocked nose and sore throat decreased in both airways and non-airways disease participants over the study period. This trend was more marked in those with airways disease. 53 participants attended the NHS and 2 were admitted to hospital. Reported parental anxiety scores remained extremely high throughout the study period. **Conclusions:** There were no positive tests for SARS-CoV-2 infection, although symptoms suggestive of SARS-CoV-2 were common. This implies that either self and family isolation (shielding) measures have been effective, or similar to healthy children, immunocompromised children are less affected by SARS-CoV-2 infection than adults. Anxiety about SARS-CoV-2 infection remains extremely high. Trial registration: NCT04382508

Strengths

- First study to monitor a cohort of immunocompromised children of this size (1490 participants)
- The study period encompasses the height of the epidemic in the UK and subsequent lockdown period.

Limitations

- Self-reported information is unverified by clinical review
- Inconsistent completion of weekly questionnaires over the study period although this is offset by high median response rate (83%)

SUMMARY BOX

What is already known on this topic

- Fewer cases of SARS-CoV-2 infection have been reported in children and young people compared to adults.
- However, information on SARS-CoV-2 prevalence, progression and outcome in this age group is still limited.
- In addition, whether children and young people with pre-existing comorbidities are more likely to contract SARS-CoV-2 infection remains unclear.

What this study adds

- There were no positive tests for SARS-CoV-2 infection in a large cohort of 1490 immunocompromised children and young people between March and July 2020.
- The frequency of cough, blocked nose and sore throat decreased during this time period, suggesting that shielding measures may have been effective in reducing the transmission of respiratory viruses in these individuals.
- Parents of immunocompromised children and young people report high levels of anxiety regarding SARS-CoV-2 infection.

INTRODUCTION

The 2019 coronavirus pandemic (COVID-19) is an ongoing global health crisis with over 11,500,000 cases and in excess of 500,000 deaths worldwide. The illness is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). As of 5th August 2020, the World Health Organisation (WHO) reported 306,297 cumulative cases of confirmed SARS-CoV-2 infection in the United Kingdom (UK) population of 68.1 million, giving a cumulative incidence of 0.004% [1].

SARS-CoV-2 causes mild or moderate upper respiratory tract infection in the majority of children, with fever and cough being the most common symptoms, although many are asymptomatic [2]. In children, fewer cases of SARS-CoV-2 infection have been reported compared to adults [3]. However, it remains unclear how many children in the community have been infected, with the results of seroprevalence studies awaited [4].

Data demonstrating an increased risk of severe disease in immunocompromised adults are emerging (A. Richter, personal communication, publication submitted). Children with significant co-morbidities are also currently considered to be at higher risk of severe infection. They were given specific precautionary advice when UK lockdown was applied, to slow the spread of SARS-CoV-2, on 23rd March 2020 [5,6].

The primary objective of this study is to assess the frequency and severity of SARS-CoV-2 infection in immunocompromised children and young people, a subset of the population in whom there is limited reported data.

METHODS

In this prospective cohort study, immunocompromised patients under 18 years were identified by the clinical teams at 46 centres across the UK. Children and young people were considered to be immunocompromised if they required an annual influenza vaccination due to their underlying condition or medication. Study design included patient and public involvement (PPI). Parents of children on immunosuppressive drugs were asked about their willingness to participate in such a study and whether they had any specific questions or anxieties.

Parents and participants were sent age-appropriate patient information sheets and asked to complete an online consent form. If they did not reply after receiving electronic reminders in the following three weeks, they were removed from the study database. Following completion of online consent, participants were sent a weekly online questionnaire based on the International Severe Acute Respiratory and emerging Infections Consortium (ISARIC) and WHO COVID-19 Case Report Form [7], with questions also incorporating PPI feedback (Supplementary Online Appendix B: Weekly questionnaire). Depending on the age and ability of the child or young person, questionnaires were either completed by the participant or their parent or carer.

From 16th March 2020, information was collected regarding symptom presentation, test results, NHS attendance, hospital admission and the effects of COVID-19 on daily life. Loss of smell or taste was added to the weekly questionnaire at week 14 following emerging evidence for anosmia and ageusia in COVID-19 disease. Study recruitment closed on 4th July 2020. Data collection is ongoing and follow up is planned to continue for 12 months. The study was approved by the Leeds NHS Research Ethics Committee (IRAS 281544).

Statistical Analysis

Longitudinal data were collected as participants were asked to complete a weekly online questionnaire for one year. We report data up to the 4th July 2020, when lockdown restrictions in the UK were eased. All questionnaire data collected over this 16 week study period were included in the analysis, although some participants did not complete the questionnaire every week. Participants who did not complete any questionnaires were not included in the analysis. Analysis assumed that the date of entry into the study was the date of the first completed questionnaire. Data were cleaned and analysed every week and a top level report provided to NHS

 England and the Royal College of Paediatrics and Child Health (RCPCH). The descriptive statistics presented in this paper were analysed using SAS9.4.

RESULTS

Recruitment increased over the 16 week study period (Figure 1). By week 16, 1490 eligible patients or their parents had consented. Weekly online questionnaire response rate varied between 74% and 100% (Figure 1). The median age of participants was 11 years (range 0 – 18 years). 54.5% of participants were female. yε. istics of par. Baseline characteristics of participants are shown in Table 1.

	Male	Female	Total
	n (%)	n (%)	n (%)
Primary diagnosis:			
Juvenile idiopathic arthritis	140 (20.6%)	314 (38.7%)	454 (30.5%)
Other rheumatological diagnoses	48 (7.1%)	110 (13.6%)	158 (10.6%)
Immunodeficiency disorders	64 (9.4%)	53 (6.5%)	117 (7.9%)
Solid organ or bone marrow transplant	53 (7.8%)	36 (4.4%)	89 (6.0%)
Renal disease	56 (8.2%)	27 (3.3%)	83 (5.6%)
Malignant haematology & oncological diagnoses	51 (7.5%)	28 (3.5%)	79 (5.3%)
Airways disease	29 (4.3%)	24 (3.0%)	53 (3.6%)
Inflammatory bowel disease	29 (4.3%)	23 (2.8%)	52 (3.5%)
Diabetes	30 (4.4%)	19 (2.3%)	49 (3.3%)
Neurological diagnoses	20 (2.9%)	10 (1.2%)	30 (2.0%)
Other gastroenterology & hepatology diagnoses	7 (1.0%)	12 (1.5%)	19 (1.3%)
Other	26 (3.8%)	34 (4.2%)	60 (4.0%)
Missing diagnosis	126 (18.6%)	121 (14.9%)	247 (16.6%)
Total	679 (45.6%)	811 (54.4%)	1490 (100%)
Medication:			
Methotrexate	137 (20.2%)	249 (30.7%)	386 (25.9%)
Anti-TNF therapy	101 (14.9%)	202 (24.9%)	303 (20.3%)
Corticosteroids	134 (19.7%)	115 (14.2%)	249 (16.7%)
Other antibiotics and antivirals	105 (15.5%)	63 (7.8%)	168 (11.3%)
Calcineurin inhibitors	87 (12.8%)	71 (8.8%)	158 (10.6%)
Mycophenolate mofetil (MMF)	64 (9.4%)	67 (8.3%)	131 (8.8%)
Other disease modifying anti-rheumatic drugs	56 (8.2%)	53 (6.5%)	109 (7.3%)
Inhalers	46 (6.8%)	40 (4.9%)	86 (5.8%)
Insulin	46 (6.8%)	36 (4.4%)	82 (5.5%)
Non-steroidal anti-inflammatory drugs (NSAIDs)	21 (3.1%)	51 (6.3%)	72 (4.8%)
Chemotherapy	41 (6.0%)	27 (3.3%)	68 (4.6%)
Azithromycin	40 (5.9%)	28 (3.5%)	68 (4.6%)
Hydroxychloroquine	11 (1.6%)	44 (5.4%)	55 (3.7%)
Tocilizumab	16 (2.4%)	33 (4.1%)	49 (3.3%)
Intravenous or subcutaneous immunoglobulin	21 (3.1%)	17 (2.1%)	38 (2.6%)
Other biologic drugs	14 (2.1%)	22 (2.7%)	36 (2.4%)
Total	679	811	1490

Table 1: Baseline characteristics: primary diagnosis and medication

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Information regarding primary diagnosis was incomplete for 247 (16.6%) participants. Of 1368 participants who completed at least one weekly online questionnaire, 922 (67.4%) reported at least one symptom consistent with suspected SARS-CoV-2 infection over the study period. 476 (34.8%) reported 3 or more simultaneous symptoms. The most frequently reported symptoms included joint pain, fatigue, headache, nausea and muscle pain. Symptoms according to primary diagnosis and medication can be found in Supplementary Online Appendix C.

Heat map visualisation of the dataset suggests a degree of association between certain symptom pairs (Figure 2a). The frequency of cough, blocked nose and sore throat decreased in both airways and non-airways disease participants over the study period (Figure 2b and 2c). This trend was more marked in those with airways disease (Figure 2b).

53 participants (3.9%) visited primary or secondary NHS care due to concerns about SARS-CoV-2 infection, of whom 47 (88.7%) reported symptoms. Two participants were admitted to hospital. 135 participants (9.9%) underwent a viral PCR test for SARS-CoV-2 infection. 110 of these reported symptoms. None of the study participants tested positive for SARS-CoV-2 infection. 137 participants had their medication suspended or changed during the study period, of whom 117 (85.4%) reported symptoms.

Figure 3a illustrates relatively static low school attendance over the 16 week study period, during which schools were closed to the majority of children. 62% of questionnaire respondents reported high levels of anxiety (scores of 7 to 10 out of 10) at the start of the study, with anxiety levels remaining extremely high throughout (Figure 3b). With the easing of lockdown restrictions in July 2020, anxiety themes included concerns regarding the severity of SARS-CoV-2 infection, the re-opening of schools and a second wave of infection.

DISCUSSION

While 922 (67.4%) participants reported one or more symptoms consistent with suspected SARS-CoV-2 infection, no participant tested positive for SARS-CoV-2,

 suggesting an absence of symptom specificity [2] and emphasising that these patients did not have severe SARS-CoV-2 infection needing hospital admission. This study period encompassed the peak in confirmed SARS-CoV-2 cases in the UK, during which time many immunocompromised children were shielding. In addition, during the initial weeks of the outbreak, viral PCR tests were only performed if a child was admitted to hospital. As only 9.9% of participants were tested, some cases of mild SARS-CoV-2 disease may have been missed.

In the UK, of the 651 children with laboratory confirmed SARS-CoV-2, between 17th January and 3rd July 2020, 375 (57.6%) did not have an underlying co-morbidity [8]. In the United States, the majority of children admitted to intensive care with SARS-CoV-2 infection had a pre-existing co-morbidity [9).However, the contribution of co-morbidity to SARS-CoV-2 disease severity remains unclear due to the low prevalence of severe disease in this age group [10]. Limited data for paediatric oncology, liver transplant, chronic kidney disease (CKD) and inflammatory bowel disease (IBD) patients is reassuring, with few cases of mostly mild infection reported [11-14].

The fact that the frequency of cough, blocked nose and sore throat decreased in both airways and non-airways disease participants over the study period suggests that shielding measures may have been effective in reducing the transmission of respiratory viruses in these children [15]. Overall, participants showed few symptoms specific for SARS-CoV-2 disease, had few hospital admissions and had no positive tests for SARS-CoV-2 infection. This was despite the study period occurring at the height of the pandemic in the UK, which may also suggest that similar to healthy children, immunocompromised children are less affected by SARS-CoV-2 infection than adults [16].

Only 53 participants sought NHS attention and only two were admitted to hospital, in keeping with reports that the proportion of vulnerable paediatric inpatients has significantly decreased during the pandemic [17]. This implies that either families were successfully managing minor or chronic symptoms at home, or they were not accessing healthcare appropriately. A decrease in attendances to Paediatric

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Emergency Departments has been reported in the UK following the start of the pandemic [18]. While concerns were initially raised about delayed presentations of serious illness [19], a formal survey found this to be rare [20]. It may also be possible that the reduction in "normal" upper and lower respiratory infection transmission prevented by self-isolation and increased hand hygiene, during the lockdown period has had the indirect effect of also reducing other reported minor or chronic symptoms in this cohort.

More than 50% of questionnaire respondents reported high levels of anxiety at the start of the study, similar to national figures [21]. However, anxiety scores remained extremely high during this study, whereas average anxiety scores nationally reduced from 5.2 to 4.0 out of 10 by May 2020 [21]. With the advice to stop shielding from 31st July 2020, the planned re-opening of schools in September 2020 and uncertainty regarding a second wave of infection, these families require up-to-date, evidence-based guidance on the need for specific precautionary measures. If such evidence is not available, a holistic, child-centred approach must be taken by clinicians on a case by case basis [6].

Study limitations include patient or parent reported information, unverified by clinical review. Inconsistent completion of weekly questionnaires over the study period may have affected the data, although a median response rate of 83% (range 74% to 100%) is high for a questionnaire study. Over-reporting of symptoms may have occurred particularly as anxiety levels were high. Under-reporting of symptoms may also have occurred due to the nature of the study, which required weekly participation.

Information on SARS-CoV-2 prevalence, progression and outcomes in children is still limited, with the results of national surveillance programmes awaited. Whether children with pre-existing co-morbidities are more likely to contract SARS-CoV-2 infection remains unclear. Further research is warranted to identify risk factors for severe infection in children and young people to aid health service planning, improve public health messaging and minimise unforeseen consequences of imposed restrictions on child health and wellbeing.

In conclusion, this is the first study to prospectively observe a cohort of immunocompromised paediatric patients during the COVID-19 pandemic. We report results from a large cohort of 1490 patients over 16 weeks. Although symptoms indicative of SAR-CoV-2 infection were common in this cohort of immunocompromised children and young people, there were no positive tests for SARS-CoV-2 infection. Shielding measures appear to have been effective at reducing the frequency of respiratory tract symptoms. Despite this, parents remain very anxious, highlighting the pressing need to clearly define and communicate SARS-CoV-2 risk in children and young people. ior peet teries only

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Contributorship statement: MS, RP and HdG drafted and revised the manuscript. All authors reviewed and approved the final manuscript as submitted. All authors contributed to the recruitment of participants.

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Competing interests: All authors have completed the *ICMJE* uniform disclosure form at www.icmje.org/coi_disclosure.pdf. HdG received grant funding from the BPAIIG for the submitted work; there are no other relationships or activities that could appear to have influenced the submitted work.

Dissemination declaration: We plan to disseminate the results to study participants and their parents.

Data sharing statement: Research data may be made available upon reasonable request, wherever legally and ethically possible.

Transparency declaration: The Corresponding Author affirms that the manuscript is an honest, accurate and transparent account of the study being reported. No important aspects of the study have been omitted. Any discrepancies from the study as planned have been explained.

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Figure 1: Study recruitment and weekly questionnaire response rate

Figure 2: Heat map depicting association of reported symptoms during the study period

Scale of 0 – 800 representing cumulative frequency of simultaneously reported symptoms over the study period

Figure 3: Reported symptoms in airways disease patients over time

Figure 4: Reported symptoms in non-airways disease patients over time

Figure 5: Reported school attendance over time

Figure 6: Reported anxiety levels over time

Anxiety scores out of 10 categorised into mild (1 to 3), moderate (4 to 6) and severe (7 to 10) anxiety, with a score of 0 indicating no anxiety.

REFERENCES

1 https://covid19.who.int/region/euro/country/gb (accessed August 2020)

2 Assaker R, Colas A-E, Julien-Marsollier F, et al. Presenting symptoms of COVID-19 in children: a meta-analysis of published studies. *Br J Anaesth* 2020. <u>https://bjanaesthesia.org/article/S0007-0912(20)30408-6/abstract</u> (accessed July 2020).

3 Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. *JAMA* 2020;323(13):1239–42.

4 Ladhani SN, Amin-Chowdhury Z, Amirthalingam G, et al. Prioritising paediatric surveillance during the COVID-19 pandemic. *Arch Dis Child* 2020;105(7):613–5.

5 <u>https://www.gov.uk/government/publications/guidance-on-shielding-and-protecting-</u> <u>extremely-vulnerable-persons-from-covid-19/covid-19-guidance-for-young-people-</u> <u>on-shielding-and-protecting-people-most-likely-to-become-unwell-if-they-catch-</u> <u>coronavirus</u> (accessed July 2020).

6 COVID-19 rapid guideline: children and young people who are immunocompromised. NICE guideline [NG174]. 2020. https://www.nice.org.uk/guidance/ng174 (accessed July 2020).

7 <u>https://isaric.tghn.org/COVID-19-CRF/</u> (accessed July 2020).

8 Swann OV, Holden, KA, Turtle L, et al. Clinical characteristics of children and young people admitted to hospital with covid-19 in United Kingdom: prospective multicentre observational cohort study. *BMJ* 2020;**370**:m3249

9 Shekerdemian LS, Mahmood NR, Wolfe KK, et al. Characteristics and Outcomes of Children With Coronavirus Disease 2019 (COVID-19) Infection Admitted to US and Canadian Pediatric Intensive Care Units. *JAMA Pediatr* 2020. <u>https://jamanetwork.com/journals/jamapediatrics/fullarticle/2766037</u> (accessed July 2020).

10 Docherty AB, Harrison EM, Green CA, et al. Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study. *BMJ* 2020;369:m1985.

11 Ferrari A, Zecca M, Rizzari C, et al. Children with cancer in the time of COVID-19: An 8-week report from the six pediatric onco-hematology centers in Lombardia, Italy. *Pediatr Blood Cancer* 2020:67(8):e28410.

12 D'Antiga L. Coronaviruses and Immunosuppressed Patients: The Facts During the Third Epidemic. *Liver Transpl* 2020;26(6):832–4.

13 Turner D, Huang Y, Martín-de-Carpi J, et al. Corona Virus Disease 2019 and Paediatric Inflammatory Bowel Diseases: Global Experience and Provisional Guidance (March 2020) from the Paediatric IBD Porto Group of European Society of Paediatric Gastroenterology, Hepatology, and Nutrition. *J Pediatr Gastroenterol Nutr* 2020;70(6):727–33.

14 Plumb L, Benoy-Deeney F, Casula A et al. COVID-19 in children with chronic kidney disease: findings from the UK renal registry. *Arch Dis Child* 2020. <u>https://adc.bmj.com/content/early/2020/07/24/archdischild-2020-319903</u> (accessed July 2020)

15 Chan KH, Lee P, Chan CY, et al. Monitoring respiratory infections in covid-19 epidemics. *BMJ* 2020;369:m1628.

16 Mehta NS, Mytton OT, Mullins EWS, et al. SARS-CoV-2 (COVID-19): What do we know about children? A systematic review. *Clin Infect Dis* 2020.

https://academic.oup.com/cid/article/doi/10.1093/cid/ciaa556/5835843 (accessed July 2020).

17 Issitt R, Booth J, Bryant W, et al. Coronavirus (COVID-19) infection in children at a specialist centre: outcome and implications of underlying high-risk comorbidities in a paediatric population. *medRxiv* 2020.05.20.

18 Isba R, Edge R, Jenner R, et al. Where have all the children gone? Decreases in paediatric emergency department attendances at the start of the COVID-19 pandemic of 2020. *Arch Dis Child* 2020;105(7):704–704.

19 Lynn RM, Avis JL, Lenton S, et al. Delayed access to care and late presentations in children during the COVID-19 pandemic: a snapshot survey of 4075 paediatricians in the UK and Ireland. *Arch Dis Child* 2020.

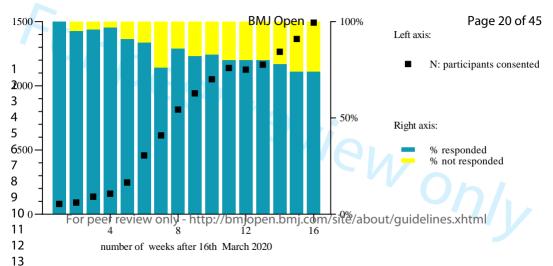
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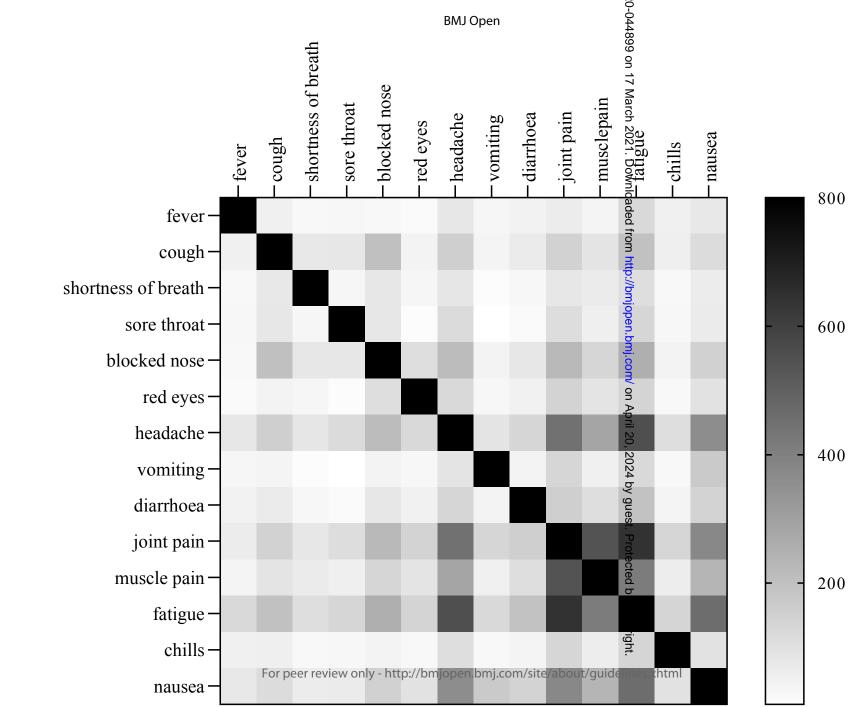
20 Roland D, Harwood R, Bishop N, et al. Children's emergency presentations during the COVID-19 pandemic. *Lancet Child Adolesc Health* 2020;4(8):e32–3.

21 Coronavirus (COVID-19) Infection Survey pilot - Office for National Statistics. https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/coronaviruscovid19infectionsurveypilot/latest#incidence-rate (accessed July 2020).

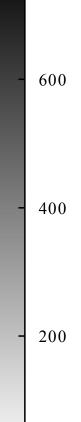
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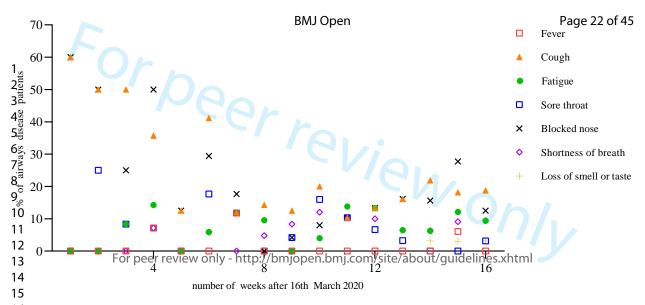
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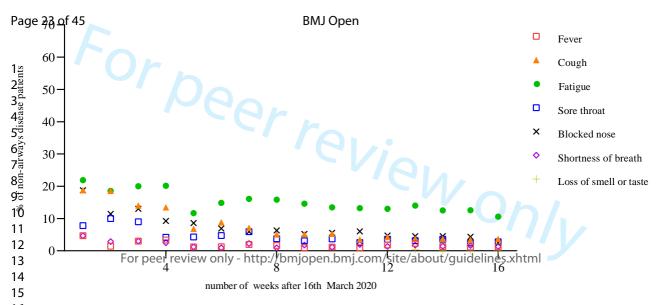


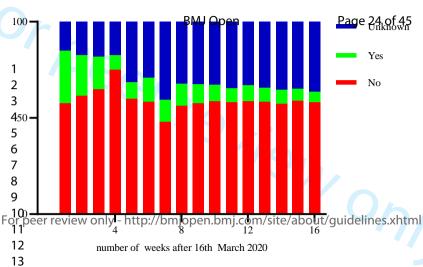


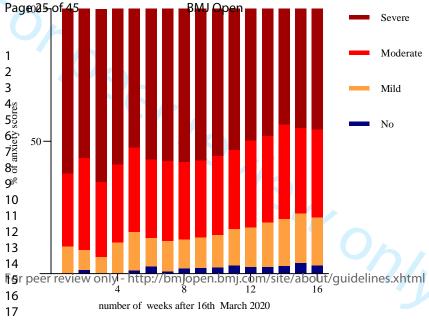
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Appendix A: List of ImmunoCOVID19 Study Group Co-authors

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		Paediatric		02
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Appendix B: Weekly Questionnaire

sympto	veek beginning xx/xx/xxxx have you expe oms?	enenceu any of the following
1.1	I have had no symptoms	O I have had no symptoms O I have had symptoms
1.2	Measured temperature above 38 °C	O Yes O No
1.2.1	If 'Measured temperature above 38 °C' is equal to 'Yes' answer this question: Which days did you measure a temperature above 38 °C?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.2.2	If 'Measured temperature above 38 °C' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.3	Cough	O Yes O No
1.3.1	If 'Cough' is equal to 'Yes' answer this question: Which days did you experience a cough?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.3.2	If 'Cough' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.4	Shortness of breath	O Yes O No
1.4.1	If 'Shortness of breath' is equal to 'Yes' answer this question: Which days did you experience shortness of breath?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday

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		□ Sunday
1.4.2	If 'Shortness of breath' is equal to	O Yes
	'Yes' answer this question:	O No
	Have you experienced a worsening of	
	the above symptom?	
1.5	Sore throat	O Yes
		O No
1.5.1	If 'Sore throat' is equal to 'Yes'	□ Monday
1.0.1	answer this question:	□ Tuesday
	•	
	Which days did you experience sore	□ Wednesday
	throat?	□ Thursday
		🗆 Friday
		Saturday
		□ Sunday
		, ,
1.5.2	If 'Sore throat' is equal to 'Yes'	O Yes
1.0.2	answer this question:	O No
	Have you experienced a worsening of	
	the above symptom?	
1.6	Blocked nose	O Yes
		O No
1.6.1	If 'Blocked nose' is equal to 'Yes'	Monday
	answer this question:	□ Tuesday
	Which days did you experience blocked	□ Wednesday
	nose?	□ Thursday
		□ Friday
	7	□ Saturday
		□ Sunday
1.6.2	If 'Blocked nose' is equal to 'Yes'	O Yes
	answer this question:	O No
	Have you experienced a worsening of	
	the above symptom?	
1.7	Red eyes	O Yes
		O No
1.7.1	If 'Red eyes' is equal to 'Yes' answer	□ Monday
	this question:	□ Tuesday
	•	-
	Which days did you experience red	□ Wednesday
	eyes?	□ Thursday
		🗆 Friday
		□ Saturday
		□ Sunday
1.7.2	If 'Red eyes' is equal to 'Yes' answer	O Yes
1.1.2	this question:	O No
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	Have you experienced a worsening of the above symptom?	
1.8	Headache	O Yes O No
1.8.1	If 'Headache' is equal to 'Yes' answer this question: Which days did you experience headache?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.8.2	If 'Headache' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.9	Joint pain	O Yes O No
1.9.1	If 'Joint pain' is equal to 'Yes' answer this question: Which days did you experience joint pain?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.9.2	If 'Joint pain' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.10	Muscle pain	O Yes O No
1.10.1	If 'Muscle pain' is equal to 'Yes' answer this question: Which days did you experience muscle pain?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.10.2	If 'Muscle pain' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.11	Fatigue	O Yes O No

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1.11.1	If 'Fatigue' is equal to 'Yes' answer	□ Monday
	this question:	□ Tuesday
	Which days did you experience fatigue?	□ Wednesday
		□ Thursday
		□ Friday
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		□ Saturday
		□ Sunday
1.11.2	If 'Fatigue' is equal to 'Yes' answer	O Yes
	this question:	O No
	Have you experienced a worsening of	
	the above symptom?	
1.12	Chills	O Yes
		O No
1.12.1	If 'Chills' is equal to 'Yes' answer this	□ Monday
	question:	🗆 Tuesday
	Which days did you experience chills?	🗆 Wednesday
		□ Thursday
	\sim	□ Friday
		□ Saturday
		□ Sunday
1.12.2	If 'Chills' is equal to 'Yes' answer this	O Yes
	question:	O No
	Have you experienced a worsening of	
	the above symptom?	
1.13	Nausea	O Yes
		O No
1.13.1	🛛 If 'Nausea' is equal to 'Yes' answer 🥔	🗆 Monday
	this question:	Tuesday
	Which days did you experience nausea?	□ Wednesday
		□ Thursday
		□ Friday
		□ Saturday
		□ Sunday
1.13.2	If 'Nausea' is equal to 'Yes' answer	O Yes
	this question:	O No
	Have you experienced a worsening of	-
	the above symptom?	
1.14	Vomiting	O Yes
	Ŭ	O No
1.14.1	If 'Vomiting' is equal to 'Yes' answer	□ Monday
	this question:	□ Tuesday
	Which days did you experience	□ Wednesday
	vomiting?	□ Thursday
		□ Friday

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		□ Saturday □ Sunday
1.14.2	If 'Vomiting' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.15	Diarrhoea	O Yes O No
1.15.1	If 'Diarrhoea' is equal to 'Yes' answer this question: Which days did you experience diarrhoea?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.15.2	If 'Diarrhoea' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.16	Loss of smell or taste	O Yes O No
1.16.1	If 'Loss of smell or taste' is equal to 'Yes' answer this question: Which days did you experience loss of smell or taste?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.16.2	If 'Loss of smell or taste' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.17	Other symptoms	
2.1	Has your child changed medication this week?	O Yes O No
2.1.1	If 'Has your child changed medication this week?" if equal to 'Yes' answer this question: What medication has changed and how?	

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2.2	Was your child in contact with someone who is diagnosed with or suspected to have coronavirus?	O Yes O No O Not known
2.3	Did your child visit the NHS because you were worried about coronavirus infection?	O Yes O No O Not known
2.4	Did your child have a test for coronavirus?	O Yes O No O Not known
2.5	Did your child have a confirmed diagnosis of coronavirus infection?	O Yes O No O Not known
2.6	Was your child admitted to hospital because of a coronavirus infection?	O Yes O No O Not known
2.6.1	If 'Was your child admitted to hospital because of a coronavirus infection?' is equal to 'Yes' answer this question: When was your child admitted?	dd-mm-yyyy
2.6.2	If 'Was your child admitted to hospital because of a coronavirus infection?' is equal to 'Yes' answer this question: How many days was your child admitted?	
2.7	Did you have to self-isolate your child because they had symptoms or because of medical advice related to coronavirus?	O Yes O No O Not known
2.7.1	If 'Did you have to self-isolate your child because they had symptoms or because of medical advice related to coronavirus?' is equal to 'Yes' answer this question: How many days did you self-isolate your child this week?	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
2.8	Were immunosuppressive drugs postponed because of coronavirus infection?	O Yes O No O Not known
2.8.1	If 'Were immunosuppressive drugs postponed because of coronavirus infection?' is equal to 'Yes' answer this question: How many days did you	□ 1 □ 2 □ 3 □ 4

postpone the immunosuppressants this week? 5 0 Did your child miss any sports or fun activities because of the coronavirus pandemic? 0 Yes 0.1 If 'Did your child miss any sports or fun activities because of the 0 Not known	
 week? Did your child miss any sports or fun activities because of the coronavirus pandemic? 0 Yes 0 No 0 Not known 	
activities because of the coronavirus pandemic?O No O Not known0.1If 'Did your child miss any sports or	
coronavirus pandemic?' is equal to Yes answer this question: How many activities did your child miss?	
10 Did your child miss school because of coronavirus infection? O Yes O No O Not known	
10.1 If 'Did your child miss school because of coronavirus infection?' is equal to Yes answer this question: 1 How many days of school did your child miss this week? 3 10.1 6 10.1 7	
I1 On a scale of 0-10, how worried are you about coronavirus affecting your child? (0 = not worried, 10 = extremely worried)	
I2 Is there anything that you are particularly worried about that you would like to share?	
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Appendix C:

Symptom frequency by primary diagnosis

Symptoms	JIA (%)	Other rheumatology diagnosis (%)	Airways disease (%)	Immunodeficiency disorder (%)	Diabetes (%)	Solid organ or bone marrow transplant (%)	Nephrotic syndrome (%)	Other kidney disease (%)	IBD (%)	Otसिंग gastroenterology and hepa奴logy (%)	Malignant haematology & oncology (%)	Neurology (%)	Othe (%)
Fever	1.63	0.81	0.24	0.73	0.16	0.41	0.08	0.08	0.00	0. 6 8	0.57	0.24	0.33
Cough	4.80	1.54	1.63	1.54	0.24	1.46	0.57	0.16	0.08	0. 0.	0.89	0.16	0.65
SOB	1.63	0.89	0.65	0.65	0.08	0.08	0.16	0.08	0.16	0.00 0	0.16	0.08	0.81
Sore throat	6.02	2.28	0.98	0.98	0.16	0.41	0.24	0.24	0.49	0.33 0.45	0.89	0.33	0.89
Blocked nose	7.48	2.60	1.79	1.30	0.49	1.30	0.65	0.41	0.73	enloæled Bom אلتله عنهما الإي المحافظة المحافظة والمحافظة المحافظة والمحافظة والمحافظة والمحافظة والمحافظة والم مناطقة المحافظة والمحافظة والمحافظة والمحافظة والمحافظة والمحافظة والمحافظة والمحافظة والمحافظة والمحافظة والمحا مناطقة والمحافظة والمح	0.57	0.24	1.22
Red eyes	4.07	2.11	0.57	1.14	0.49	0.41	0.49	0.08	0.33	0.00 0.00	0.57	0.16	0.57
Headache	11.30	4.96	1.30	2.20	0.98	1.54	0.65	0.33	0.98	0.49	1.87	0.73	1.63
Vomiting	3.66	0.89	0.33	0.65	0.08	0.89	0.24	0.24	0.00	ے. 0.ಕ್ಷಣ	1.14	0.08	0.98
Diarrhoea	4.23	1.63	0.57	1.46	0.49	0.81	0.33	0.33	0.81	0.46	0.73	0.24	0.73
Joint pain	19.84	3.98	0.24	1.22	0.16	1.30	0.65	0.24	0.81	0.50Ti	1.87	0.41	1.06
Muscle pain	8.46	3.33	0.57	1.22	0.33	1.06	0.65	0.24	0.49	0.j	1.38	0.33	0.81
Fatigue	13.98	4.07	1.30	2.60	0.49	1.30	0.89	0.57	1.30	20 2 4	3.25	0.89	1.30
Chills	2.11	1.06	0.08	0.49	0.08	0.41	0.08	0.08	0.24	b∯ guest. Protected by copyright.	0.33	0.33	0.24

Symptom frequency by medication

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Symptom f	requency by me	dication				1-044899 on 17			
Symptoms	Methotrexate (%)	Hydroxychloroquine (%)	Other DMARDs (%)	Corticosteroids (%)	Anti-TNF therapy (%)		ilizumab (%)	Other biologic drugs (%)	MMF (%)
Fever	4.92	9.09	0.92	5.62	4.62	021.	4.08	11.11	5.34
Cough	12.44	14.55	9.17	14.06	15.84	Dov	4.08	8.33	15.27
SOB	3.11	3.64	1.83	6.02	4.29	Downloaded from	8.16	5.56	4.58
Sore throat	16.06	21.82	18.35	11.24	18.15	bade	18.37	8.33	10.69
Blocked nose	19.69	25.45	13.76	13.65	23.76	ed fi	14.29	19.44	17.56
Red eyes	12.69	10.91	8.26	10.44	11.55	rom	14.29	13.89	6.11
Headache	29.27	45.45	29.36	28.11	30.69	http://bmjopen.bmj.com/	28.57	27.78	25.19
Vomiting	12.18	9.09	4.59	12.05	8.25	0://b	12.24	8.33	7.63
Diarrhoea	9.84	10.91	11.93	11.65	11.88		20.41	8.33	12.98
Joint pain	43.78	43.64	33.03	26.91	46.20	per	69.39	36.11	22.14
Muscle pain	20.98	41.82	22.02	24.50	21.45	ı.br	30.61	25.00	19.08
Fatigue	39.12	43.64	29.36	34.14	34.65	J. CC	40.82	38.89	24.43
Chills	5.44	12.73	5.50	7.23	6.93		6.12	5.56	6.87
Nausea	31.09	27.27	15.60	20.88	25.41	on Apri	26.53	16.67	15.27
Loss of smell	0.52	1.82	0.00	0.80	0.33	Apr	0.00	0.00	1.53

Abbreviations: DMARDs disease modifying anti-rheumatic drugs, MMF mycophenolate mofetil

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Symptoms	Chemotherapy (%)	Azathioprine (%)	Other antibiotics and antivirals (%)	Tacrolimus (%)	Inhalers (%)	04 48 99 0 Insulin (%)	NSAIDs (%)	IV or SC IG (%)
Fever	10.29	7.35	7.14	3.80	8.14	- - - - - - - - - - - - - - - - - - -	9.72	2.63
Cough	14.71	25.00	18.45	15.19	31.40	₹ 8.54	15.28	13.16
SOB	5.88	8.82	5.95	3.16	16.28	March 3.66	8.33	7.89
Sore throat	8.82	13.24	10.71	6.96	18.60	2021 - 9.76	13.89	0.00
Blocked nose	10.29	16.18	13.69	14.56	36.05		25.00	10.53
Red eyes	10.29	8.82	9.52	5.70	15.12	Q 9.76	16.67	5.26
Headache	27.94	32.35	20.83	18.35	32.56	<u>5</u> 25.61	44.44	15.79
Vomiting	22.06	10.29	14.29	8.86	12.79	a de 7.32	9.72	5.26
Diarrhoea	14.71	10.29	13.10	10.13	12.79	ă <u></u> 10.98	12.50	5.26
Joint pain	29.41	14.71	20.24	17.09	18.60	9 3 8.54	61.11	18.42
Muscle pain	23.53	11.76	17.26	14.56	19.77	7.32	31.94	7.89
Fatigue	47.06	30.88	30.36	18.35	30.23	17.07	54.17	18.42
Chills	7.35	2.94	4.17	3.80	6.98	Downloaded from http://bmjopen 10.98 8.54 17.32 17.07 1.22 10.98	11.11	0.00
Nausea	30.88	19.12	17.86	12.66	20.93	9 10.98	27.78	10.53
Loss of smell	0.00	0.00	0.00	1.27	1.16	0.00	4.17	0.00

ch, Abbreviations: NSAIDs non-steroid anti-inflammatory drugs, IV intravenous, SC subcutaneous, IG immunoglobulin

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STROBE Statement—Checklist of items that should be included in reports of cohort studies

	Item No	Recommendation	Pag No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the	2
		abstract	
		(b) Provide in the abstract an informative and balanced summary of what was	2
		done and what was found	
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being	4
Objectives	3	reported State specific objectives, including any prespecified hypotheses	4
•	3	State specific objectives, including any prespecified hypotheses	
Methods Study design	4	Present key elements of study design early in the paper	4-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of	4-6
Setting		recruitment, exposure, follow-up, and data collection	
Participants	6	(<i>a</i>) Give the eligibility criteria, and the sources and methods of selection of	4-6
1 articipants	0	participants. Describe methods of follow-up	
		(b) For matched studies, give matching criteria and number of exposed and	
		(b) For mached studies, give matching criteria and number of exposed and unexposed	
Variables	7		4-6
variables	/	Clearly define all outcomes, exposures, predictors, potential confounders, and	
Dete server /	0*	effect modifiers. Give diagnostic criteria, if applicable	4-6
Data sources/	8*	For each variable of interest, give sources of data and details of methods of	
measurement		assessment (measurement). Describe comparability of assessment methods if	
Bias	9	there is more than one group Describe any efforts to address potential sources of bias	4-6
Study size	10	Explain how the study size was arrived at	4-6
Quantitative variables	10	Explain how quantitative variables were handled in the analyses. If applicable,	4-6
Qualititative variables	11	describe which groupings were chosen and why	
Statistical methods	12	(<i>a</i>) Describe all statistical methods, including those used to control for	4-6
Statistical methods	12	confounding	
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) If applicable, explain how loss to follow-up was addressed	
		(<u>e</u>) Describe any sensitivity analyses	
Results	1.2*		6
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially	0
		eligible, examined for eligibility, confirmed eligible, included in the study,	
		completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social)	6-8
		and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	Report numbers of outcome events or summary measures over time	6-8

Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their	
		precision (eg, 95% confidence interval). Make clear which confounders were adjusted for	
		and why they were included	
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a	
		meaningful time period	
Other analyses	17	Report other analyses done-eg analyses of subgroups and interactions, and sensitivity	
		analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision.	
		Discuss both direction and magnitude of any potential bias	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations,	
		multiplicity of analyses, results from similar studies, and other relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	
Other information	on		
Funding	22	Give the source of funding and the role of the funders for the present study and, if	
		applicable, for the original study on which the present article is based	

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

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COVID-19 symptom surveillance in immunocompromised children and young people in the UK: a prospective observational cohort study

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COVID-19 symptom surveillance in immunocompromised children and young people in the UK: a prospective observational cohort study

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On behalf of the ImmunoCOVID19 study group (a full list of co-authors is provided in Supplementary Online Appendix A)

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Keywords: SARS-CoV-2, symptoms, children, immunocompromise

ABSTRACT

Objectives: To describe the frequency of symptoms compatible with SARS-CoV-2 infection in immunocompromised children and young people in the United Kingdom during the SARS-CoV-2 pandemic. To describe patient/ parent anxiety regarding SARS-CoV-2 infection in this cohort.

Design: A prospective observational cohort study.

Setting: 46 centres across the United Kingdom between 16th March and 4th July 2020. A weekly online questionnaire based on the ISARIC-WHO Case Report Form was used to collect participant reported data on symptoms, test results, NHS attendance, hospital admission and impact on daily life.

Participants: 1490 immunocompromised children, defined as those requiring an annual influenza vaccination due to their underlying condition or medication.
Main outcome measures: Incidence of SARS-CoV-2-like symptoms and patient/parent anxiety score.

Results: Over 16 weeks during the first wave of the pandemic, no SARS-CoV-2 infection was diagnosed in this large immunocompromised paediatric cohort (median age 11 years, 54.4% female). 110 symptomatic participants underwent a test for SARS-CoV-2; all were negative. 922 (67.4%) participants reported at least one symptom consistent with suspected SARS-CoV-2 infection over the study period. 476 (34.8%) reported three or more symptoms. The most frequently reported symptoms included joint pain, fatigue, headache, nausea and muscle pain. SARS-CoV-2 testing during this period was performed on admitted patients only. 137 participants had their medication suspended or changed during the study period, due to assumed COVID-19 disease risk. 62% reported high levels of anxiety (scores of 7-10 out of 10) at the start of the study, with anxiety levels remaining high throughout the study period.

Conclusions: Although symptoms related to SARS-CoV-2 infection in children were common, there were no positive tests in this large immunocompromised cohort. Symptom-based screening to facilitate early detection of SARS-CoV-2 infection may not be helpful in these individuals. Patient/ parent anxiety about SARS-CoV-2 infection was high.

Trial registration: NCT04382508

Strengths:

- Large prospective cohort of immunocompromised children
- High response rate of patients to questionnaire

Limitations:

- Patient reported data
- Limited SARS-CoV-2 testing due to shortage in national supply

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INTRODUCTION

 The 2019 coronavirus pandemic (COVID-19) is an ongoing global health crisis with over 11,500,000 cases and in excess of 500,000 deaths worldwide. The illness is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). As of 5th August 2020, the World Health Organisation (WHO) reported 306,297 cumulative cases of confirmed SARS-CoV-2 infection in the United Kingdom (UK) population of 68.1 million, giving a cumulative incidence of 0.004% [1].

SARS-CoV-2 causes mild or moderate upper respiratory tract infection in the majority of children, with fever and cough being the most common symptoms, although many are asymptomatic [2]. In children, fewer cases of SARS-CoV-2 infection have been reported compared to adults [3]. However, it remains unclear how many children in the community have been infected, with the results of seroprevalence studies awaited [4].

Data demonstrating an increased risk of severe disease in immunocompromised adults are emerging (A. Richter, personal communication, publication submitted). Children with significant co-morbidities are also currently considered to be at higher risk of severe infection. They were given specific precautionary advice when UK lockdown was applied, to slow the spread of SARS-CoV-2, on 23rd March 2020 [5,6].

The primary objective of this study is to describe the frequency of symptoms compatible with SARS-CoV-2 infection in immunocompromised children and young people, a subset of the population in whom there is limited reported data. A secondary objective of this study is to describe patient/ parent anxiety regarding SARS-CoV-2 infection.

METHODS

In this prospective cohort study, immunocompromised patients under 18 years were identified by the clinical teams at 46 hospitals across the UK (Supplementary Online

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Appendix B). Children and young people were considered to be immunocompromised if they required an annual influenza vaccination due to their underlying condition or medication, following the immunisation against infectious disease UK government guidance [7].

Patient and Public Involvement

Study design included patient and public involvement (PPI). Parents of children on immunosuppressive drugs were asked about their willingness to participate in such a study and whether they had any specific questions or anxieties.

Parents and participants were sent age-appropriate patient information sheets and asked to complete an online consent form. If they did not reply after receiving electronic reminders in the following three weeks, they were removed from the study database. Following completion of online consent, participants were sent a weekly online questionnaire based on the International Severe Acute Respiratory and emerging Infections Consortium (ISARIC) and WHO COVID-19 Case Report Form [8], with questions also incorporating PPI feedback (Supplementary Online Appendix C: Weekly questionnaire). Depending on the age and ability of the child or young person, questionnaires were either completed by the participant or their parent or carer.

From 16th March 2020, information was collected regarding symptom presentation, test results, NHS attendance, hospital admission and the effects of COVID-19 on daily life. Loss of smell or taste was added to the weekly questionnaire at week 14 following emerging evidence for anosmia and ageusia in COVID-19 disease. Study participants were advised that the study did not replace normal healthcare provision and were asked to follow government guidance and seek medical advice via emergency health care providers or the child's normal clinical team if concerns about symptoms arose. The study team did not provide advice on SARS-CoV-2 testing. During the study period testing was limited to patients possibly needing admission in the UK (due to national testing capacity).

Study recruitment closed on 4th July 2020. Data collection is ongoing and follow up is planned to continue for 12 months. The study was approved by the Leeds NHS Research Ethics Committee (IRAS 281544).

Statistical Analysis

Longitudinal data were collected as participants were asked to complete a weekly online questionnaire for one year. We report data up to the 4th July 2020, when lockdown restrictions in the UK were eased. All questionnaire data collected over this 16 week study period were included in the analysis, although some participants did not complete the questionnaire every week. Participants who did not complete any questionnaires were not included in the analysis. Analysis assumed that the date of entry into the study was the date of the first completed questionnaire. Data were cleaned and analysed every week and a top level report provided to NHS England and the Royal College of Paediatrics and Child Health (RCPCH). The descriptive statistics presented in this paper were analysed using SAS9.4. Spearman correlation was used to analyse the correlation between anxiety scores and number of symptoms. N.C

RESULTS

Recruitment increased over the 16 week study period (Figure 1). By week 16. 1490 eligible patients or their parents had consented. Weekly online questionnaire response rate varied between 74% and 100% (Figure 1). The median age of participants was 11 years (range 0 – 18 years). 54.5% of participants were female. Baseline characteristics of participants are shown in Table 1. When participants had more than one diagnosis, the primary diagnosis is reported.

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	Male Female			
	n (%)	n (%)	n (%)	
Primary diagnosis:				
Juvenile idiopathic arthritis	140 (20.6%)	314 (38.7%)	454 (30.5%)	
Other rheumatological diagnoses	48 (7.1%)	110 (13.6%)	158 (10.6%)	
Immunodeficiency disorders	64 (9.4%)	53 (6.5%)	117 (7.9%)	
Solid organ or bone marrow transplant	53 (7.8%)	36 (4.4%)	89 (6.0%)	
Renal disease	56 (8.2%)	27 (3.3%)	83 (5.6%)	
Malignant haematology & oncological diagnoses	51 (7.5%)	28 (3.5%)	79 (5.3%)	
Airways disease	29 (4.3%)	24 (3.0%)	53 (3.6%)	
Inflammatory bowel disease	29 (4.3%)	23 (2.8%)	52 (3.5%)	
Diabetes	30 (4.4%)	19 (2.3%)	49 (3.3%)	
Neurological diagnoses	20 (2.9%)	10 (1.2%)	30 (2.0%)	
Other gastroenterology & hepatology diagnoses	7 (1.0%)	12 (1.5%)	19 (1.3%)	
Other	26 (3.8%)	34 (4.2%)	60 (4.0%)	
Missing diagnosis	126 (18.6%)	121 (14.9%)	247 (16.6%)	
Total	679 (45.6%)	811 (54.4%)	1490 (100%	
Medication:				
Methotrexate	137 (20.2%)	249 (30.7%)	386 (25.9%)	
Anti-TNF therapy	101 (14.9%)	202 (24.9%)	303 (20.3%)	
Corticosteroids	134 (19.7%)	115 (14.2%)	249 (16.7%)	
Other antibiotics and antivirals	105 (15.5%)	63 (7.8%)	168 (11.3%)	
Calcineurin inhibitors	87 (12.8%)	71 (8.8%)	158 (10.6%)	
Mycophenolate mofetil (MMF)	64 (9.4%)	67 (8.3%)	131 (8.8%)	
Other disease modifying anti-rheumatic drugs	56 (8.2%)	53 (6.5%)	109 (7.3%)	
Inhalers	46 (6.8%)	40 (4.9%)	86 (5.8%)	
Insulin	46 (6.8%)	36 (4.4%)	82 (5.5%)	
Non-steroidal anti-inflammatory drugs (NSAIDs)	21 (3.1%)	51 (6.3%)	72 (4.8%)	
Chemotherapy	41 (6.0%)	27 (3.3%)	68 (4.6%)	
Azithromycin	40 (5.9%)	28 (3.5%)	68 (4.6%)	
Hydroxychloroquine	11 (1.6%)	44 (5.4%)	55 (3.7%)	
Tocilizumab	16 (2.4%)	33 (4.1%)	49 (3.3%)	
Intravenous or subcutaneous immunoglobulin	21 (3.1%)	17 (2.1%)	38 (2.6%)	
Other biologic drugs	14 (2.1%)	22 (2.7%)	36 (2.4%)	

Table 1: Baseline characteristics: primary diagnosis and medication

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Information regarding primary diagnosis was incomplete for 247 (16.6%) participants. Of 1368 participants who completed at least one weekly online questionnaire, 922 (67.4%) reported at least one symptom consistent with suspected SARS-CoV-2 infection over the study period. 476 (34.8%) reported 3 or more simultaneous symptoms. The most frequently reported symptoms included joint pain, fatigue, headache, nausea and muscle pain. Symptoms according to primary diagnosis and medication can be found in Supplementary Online Appendix D.

Figure 2a depicts the relationship between cough, fever, sore throat and shortness of breath, with some degree of overlap between these symptoms. The frequency of cough, blocked nose and sore throat decreased in both airways and non-airways disease participants over the study period (Figure 2b and 2c). This trend was more marked in those with airways disease (Figure 2b).

53 participants (3.9%) visited primary or secondary NHS care due to concerns about SARS-CoV-2 infection, of whom 47 (88.7%) reported symptoms. Two participants were admitted to hospital. 135 participants (9.9%) underwent a viral PCR test for SARS-CoV-2 infection. 110 of these reported symptoms. None of the study participants tested positive for SARS-CoV-2 infection. 137 participants had their medication suspended or changed during the study period, due to assumed risk of SARS-CoV-2 disease. Of these 117 (85.4%) reported symptoms.

Figure 3a illustrates relatively static low school attendance over the 16 week study period, during which schools were closed to the majority of children. 62% of questionnaire respondents reported high levels of anxiety (scores of 7 to 10 out of 10) at the start of the study, with anxiety levels remaining extremely high throughout (Figure 3b). With the easing of lockdown restrictions in July 2020, anxiety themes included concerns regarding the severity of SARS-CoV-2 infection, the re-opening of schools and a second wave of infection. The correlation between number of symptoms and anxiety was not significant using cross-sectional Spearman correlation.

DISCUSSION

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While 922 (67.4%) participants reported one or more symptoms consistent with suspected SARS-CoV-2 infection, of the 110 who underwent viral PCR testing, none tested positive for SARS-CoV-2, suggesting an absence of symptom specificity [2]. Symptoms of SARS-CoV-2 infection overlap with those of chronic disease exacerbations and medication side-effects. Joint pain was frequently reported, reflecting the contribution of rheumatological diagnoses to the cohort. This suggests symptom-based screening for SARS-CoV-2 infection may not be helpful in these immunocompromised children and young people.

We are unable to comment on the incidence rate of SARS-CoV-2 infection in this cohort without comprehensive serological data. However, we can assume that only mild cases of SARS-CoV-2 infection were missed as none of these 'high risk' patients had severe enough SARS-CoV-2 infection requiring hospital admission. This study period encompassed the peak in confirmed SARS-CoV-2 cases in the UK, during which time many immunocompromised children were shielding. Either shielding measures were effective, or similar to healthy children, immunocompromised children are less affected by SARS-CoV-2 infection than adults [9, 10].

In the UK, of the 651 children with laboratory confirmed SARS-CoV-2, between 17th January and 3rd July 2020, only 48 (8%) had a haematological, oncological or immunological co-morbidity [11]. There was no significant difference in the presenting symptoms of the immunocompromised compared to the rest of the paediatric cohort (O. Swann, personal communication). Limited data for paediatric oncology, liver transplant, chronic kidney disease (CKD) and inflammatory bowel disease (IBD) patients is reassuring, with few cases of mostly mild infection reported [12-16]. While some adult patients on immunosuppressive biologics may not be at higher risk of severe disease [17], other analyses suggest that adults with malignancy, autoimmune conditions, asplenia and other immunosuppressive conditions are at greater risk of COVID-19 related death [18]. However, the contribution of co-morbidity to SARS-CoV-2 disease severity in children remains unclear due to the low prevalence of severe disease in this age group [19].

The frequency of cough, blocked nose and sore throat decreased in both airways and non-airways disease participants over the study period. This may suggest that shielding measures may have been effective in reducing the transmission of respiratory viruses in these children, similar to other studies [20]. However, this observation is unsupported by serological data.

 53 participants sought NHS attention and only two were admitted to hospital, in keeping with reports that the proportion of vulnerable paediatric inpatients has significantly decreased during the pandemic [21]. This implies that either families were successfully managing minor or chronic symptoms at home, or they were not accessing healthcare appropriately. A decrease in attendances to Paediatric Emergency Departments has been reported in the UK following the start of the pandemic [22]. While concerns were initially raised about delayed presentations of serious illness [23], a formal survey found this to be rare [24]. It may also be possible that the reduction in "normal" upper and lower respiratory infection transmission prevented by self-isolation and increased hand hygiene, during the lockdown period has had the indirect effect of also reducing other reported minor or chronic symptoms in this cohort.

More than 50% of questionnaire respondents reported high levels of anxiety at the start of the study, similar to national figures [25]. However, anxiety scores remained extremely high during this study, whereas average anxiety scores nationally reduced from 5.2 to 4.0 out of 10 by May 2020 [25]. With the advice to stop shielding from 31st July 2020, the planned re-opening of schools in September 2020 and uncertainty regarding a second wave of infection, these families require up-to-date, evidence-based guidance on the need for specific precautionary measures. If such evidence is not available, a holistic, child-centred approach must be taken by clinicians on a case by case basis [6].

Study limitations include patient or parent reported information, unverified by clinical review. Inconsistent completion of weekly questionnaires over the study period may have affected the data, although a median response rate of 83% (range 74% to 100%) is high for a questionnaire study. Over-reporting of symptoms may have occurred particularly as anxiety levels were high. Under-reporting of symptoms may

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also have occurred due to the nature of the study, which required weekly participation. Only 110 out of 922 participants with symptoms underwent viral PCR testing, therefore some cases of mild SARS-CoV-2 infection may have been missed. During the initial weeks of the outbreak, viral PCR tests were only performed if a child was admitted to hospital. Although all subspecialties in each hospital were approached to take part in the study, not all decided to participate. This may have caused bias in the composition of the cohort.

Information on SARS-CoV-2 prevalence, progression and outcomes in children is still limited, with the results of national surveillance programmes awaited. Whether children with pre-existing co-morbidities are more likely to contract SARS-CoV-2 infection remains unclear. Further research is warranted to identify risk factors for severe infection in children and young people to aid health service planning, improve public health messaging and minimise unforeseen consequences of imposed restrictions on child health and wellbeing.

In conclusion, this is the first study to prospectively observe a cohort of immunocompromised paediatric patients during the COVID-19 pandemic. We report results from a large cohort of 1490 patients over 16 weeks. Although symptoms indicative of SARS-CoV-2 infection were common in this cohort of immunocompromised children and young people, none of these 'high risk' patients had severe SARS-CoV-2 infection requiring hospital admission. While this observation is reassuring, clinicians need to remain cautious when counselling families, as symptom-based screening to facilitate the early detection of SARS-CoV-2 infection may not be helpful. In addition these patients/parents remain very anxious, highlighting the pressing need to clearly define and communicate SARS-CoV-2 risk in children and young people.

Contributorship statement: RP, HdG and SF planned the study. RP, MS and HdG managed the study and contributed to all parts of the manuscript. LM managed the patient data. CD provided statistical analysis. AL, DG, DO, JL and SF contributed to managing the study and the writing, reviewing and editing of the manuscript. All members of the ImmunoCOVID group assisted with patient recruitment.

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Ethics statement: Parental consent has been obtained for all participants under the age of 16 years.

Competing interests: All authors have completed the *ICMJE* uniform disclosure form at www.icmje.org/coi_disclosure.pdf. HdG received grant funding from the BPAIIG for the submitted work; there are no other relationships or activities that could appear to have influenced the submitted work.

Dissemination declaration: We plan to disseminate the results to study participants and their parents.

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Data sharing statement: Research data may be made available upon reasonable request, wherever legally and ethically possible.

Transparency declaration: The Corresponding Author affirms that the manuscript is an honest, accurate and transparent account of the study being reported. No important aspects of the study have been omitted. Any discrepancies from the study as planned have been explained.

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Figure 1: Study recruitment and weekly questionnaire response rate

Figure 2a: Venn diagram depicting the association between fever, cough, shortness of breath and sore throat during the study period

Figure 2b: Reported symptoms in airways disease patients over time

Figure 2c: Reported symptoms in non-airways disease patients over time

Figure 3a: Reported school attendance over time

Figure 3b: Reported anxiety levels over time

Anxiety scores out of 10 categorised into mild (1 to 3), moderate (4 to 6) and severe (7 to 10) anxiety, with a score of 0 indicating no anxiety.

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REFERENCES

1 https://covid19.who.int/region/euro/country/gb (accessed August 2020)

2 Assaker R, Colas A-E, Julien-Marsollier F, et al. Presenting symptoms of COVID-19 in children: a meta-analysis of published studies. *Br J Anaesth* 2020. <u>https://bjanaesthesia.org/article/S0007-0912(20)30408-6/abstract</u> (accessed July 2020).

3 Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. *JAMA* 2020;323(13):1239–42.

4 Ladhani SN, Amin-Chowdhury Z, Amirthalingam G, et al. Prioritising paediatric surveillance during the COVID-19 pandemic. *Arch Dis Child* 2020;105(7):613–5.

5 <u>https://www.gov.uk/government/publications/guidance-on-shielding-and-protecting-</u> <u>extremely-vulnerable-persons-from-covid-19/covid-19-guidance-for-young-people-</u> <u>on-shielding-and-protecting-people-most-likely-to-become-unwell-if-they-catch-</u> <u>coronavirus</u> (accessed July 2020).

6 COVID-19 rapid guideline: children and young people who are immunocompromised. NICE guideline [NG174]. 2020. https://www.nice.org.uk/guidance/ng174 (accessed July 2020).

7 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/ attachment_data/file/931139/Green_book_chapter_19_influenza_V7_OCT_2020.pdf (accessed December 2020).

8 https://isaric.tghn.org/COVID-19-CRF/ (accessed July 2020).

9 Mehta NS, Mytton OT, Mullins EWS, et al. SARS-CoV-2 (COVID-19): What do we know about children? A systematic review. *Clin Infect Dis* 2020. https://academic.oup.com/cid/article/doi/10.1093/cid/ciaa556/5835843 (accessed July 2020).

10 Vicent MG, Martinez AP, Trabazo del Castillo M, et al. COVID-19 in pediatric hematopoietic stem cell transplantation: The experience of Spanish Group of Transplant (GETMON/GETH). *Pediatr Blood Cancer* 2020. <u>https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7361142/</u> (accessed December 2020).

11 Swann OV, Holden, KA, Turtle L, et al. Clinical characteristics of children and young people admitted to hospital with covid-19 in United Kingdom: prospective multicentre observational cohort study. *BMJ* 2020;**370**:m3249.

12 Ferrari A, Zecca M, Rizzari C, et al. Children with cancer in the time of COVID-19: An 8-week report from the six pediatric onco-hematology centers in Lombardia, Italy. *Pediatr Blood Cancer* 2020:67(8):e28410.

13 Millen GC, Arnold R, Cazier JB, et al. Severity of COVID-19 in children with cancer: Report from the United Kingdom Paediatric Coronavirus Cancer Monitoring Project. *Br J Cancer* 2020.

https://doi.org/10.1038/s41416-020-01181-0 (accessed December 2020).

14 D'Antiga L. Coronaviruses and Immunosuppressed Patients: The Facts During the Third Epidemic. *Liver Transpl* 2020;26(6):832–4.

15 Turner D, Huang Y, Martín-de-Carpi J, et al. Corona Virus Disease 2019 and Paediatric Inflammatory Bowel Diseases: Global Experience and Provisional Guidance (March 2020) from the Paediatric IBD Porto Group of European Society of Paediatric Gastroenterology, Hepatology, and Nutrition. *J Pediatr Gastroenterol Nutr* 2020;70(6):727–33.

 16 Plumb L, Benoy-Deeney F, Casula A et al. COVID-19 in children with chronic kidney disease: findings from the UK renal registry. *Arch Dis Child* 2020. https://adc.bmj.com/content/early/2020/07/24/archdischild-2020-319903 (accessed July 2020).
17 Fung M, Babik JM. COVID-19 in Immunocompromised Hosts: What We Know So Far. *Clin Infect Dis* 2020. <u>https://doi.org/10.1093/cid/ciaa863</u> (accessed December 2020).
18 Williamson EJ, Walker AJ, Bhaskaran K, et al. Factors associated with COVID-19-related death using OpenSAFELY. *Nature* 2020; **584**: 430–436.

19 Docherty AB, Harrison EM, Green CA, et al. Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study. *BMJ* 2020;369:m1985.

20 Chan KH, Lee P, Chan CY, et al. Monitoring respiratory infections in covid-19 epidemics. *BMJ* 2020;369:m1628.

21 Issitt R, Booth J, Bryant W, et al. Coronavirus (COVID-19) infection in children at a specialist centre: outcome and implications of underlying high-risk comorbidities in a paediatric population. *medRxiv* 2020.05.20.

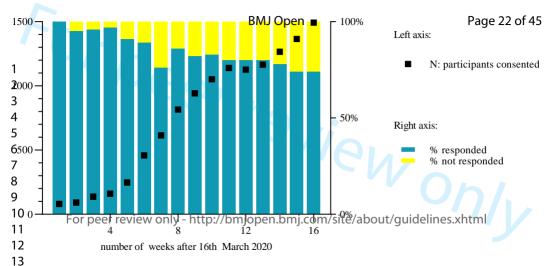
22 Isba R, Edge R, Jenner R, et al. Where have all the children gone? Decreases in paediatric emergency department attendances at the start of the COVID-19 pandemic of 2020. *Arch Dis Child* 2020;105(7):704–704.

23 Lynn RM, Avis JL, Lenton S, et al. Delayed access to care and late presentations in children during the COVID-19 pandemic: a snapshot survey of 4075 paediatricians in the UK and Ireland. *Arch Dis Child* 2020.

https://adc.bmj.com/content/early/2020/06/24/archdischild-2020-319848 (accessed July 2020).

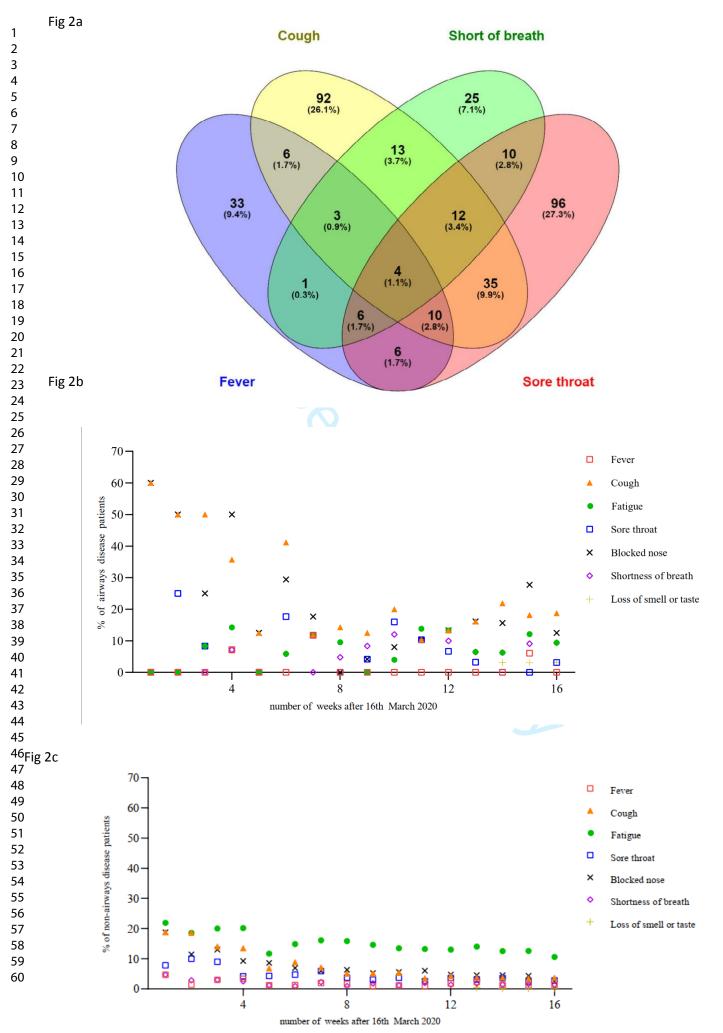
> 24 Roland D, Harwood R, Bishop N, et al. Children's emergency presentations during the COVID-19 pandemic. Lancet Child Adolesc Health 2020;4(8):e32-3.

25 Coronavirus (COVID-19) Infection Survey pilot - Office for National Statistics. https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditio nsanddiseases/bulletins/coronaviruscovid19infectionsurveypilot/latest#incidence-rate (accessed July 2020).

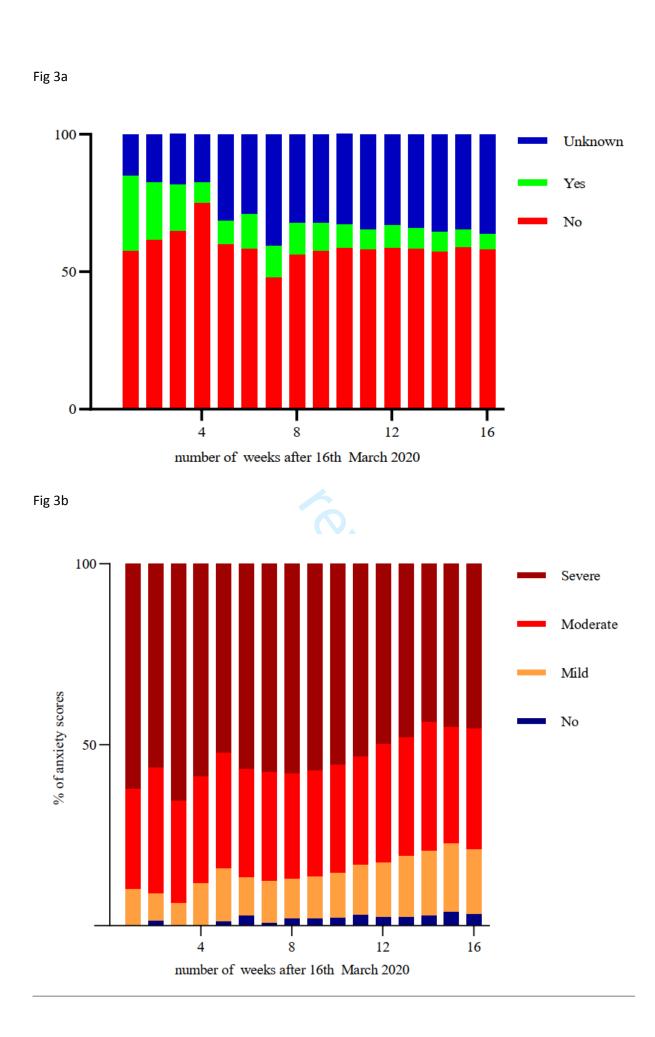


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Dr	Janet E McDonagh	Senior Lecturer in Paediatric and Adolescent Rheumatology	Versus Arthritis Centre for Epidemiology; Centre for MSK Research, University of Manchester; NIHR Biomedical Research Centre, Manchester University Hospital NHS Trust; Department of Paediatric and Adolescent Rheumatology, Royal Manchester Children's Hospital, Manchester University Hospitals NHS Trust	Centre for MSK Repearch, Stopford Building, University of Manchester Oxford Rd Manchester M13 9PT
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Dr	Ross McLean	Specialty Doctor in Paediatrics	NHS Lanarkshire	Kirklands, Fallside Road. Both	well G71 8BB
ы		Consultant in Paediatric			
Dr	Paddy McMaster	Infectious Diseases	North Manchester General Hospital	Delauneys Road, Manchester	, M8 5RB
	-	Consultant Paediatric	Department of Paediatric Nephrology, Evelina London Children's	<u>o</u>	
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Ms	Danielle Miller	Nurse	Oxford University Hospitals NHS Foundation Trust	John Radcliff hosp	1 room 10.15, Oxford, OX3 9DU
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			Biomedical Research Centre, University Hospital Southampton NHS		
			Foundation Trust and Faculty of Medicine and Institute for Life	Dag	
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		Paediatric		l fr	
		Rheumatology Clinical			
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Dr		Oncology	University Hospital Southampton NHS Foundation Trust	Tremona Road, Southampton	
Dr	Maggie Nyirenda	Consultant Paediatrician	University Hospital Lewisham	Lewisham High street, Londor	ouse, University Hospital Lewisham,
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		Consultant Paediatric		pr	,
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Dr	Sian O'Riordan	and Infectious Diseases	Leeds Children Hospital	Leeds Teaching Hospital NHS	S Trust, Great George Street, LS1 3EX
Dr	Briget Oates	Paediatric Consultant	University Hospital Crosshouse	Kilmarnock, KA2 0	
	get e titte		NIHR Southampton Clinical Research Facility and NIHR Southampton	4	
			Biomedical Research Centre, University Hospital Southampton NHS	by	
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		Paediatric Infectious	*	44 48
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Mrs	Charlotte Phillips	Team leader	Foundation Trust	4AZ
Mrs	Helen Pidgeon	Clinical Trials Assistant	Salisbury District Hospital	Salisbury, Wiltshir∰SP2 8BJ
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Appendix B: Participating Centres

Participating centre	Number of Patients Recruited	%
University Hospital Southampton	163	10.99
John Radcliffe Hospital Oxford	26	1.75
Royal Manchester Children's Hospital	89	6.00
Birmingham Women's and Children's Hospital	145	9.78
Cardiff and Vale University Health Board	35	2.36
Nottingham Children's Hospital	47	3.17
Great North Children's Hospital	169	11.40
Leeds General Infirmary Children's Hospital	18	1.21
Bradford Teaching Hospital	12	0.81
Alder Hey Children's Hospital Liverpool	42	2.83
Great Ormond Street Hospital	176	11.87
St Georges Hospital London	30	2.02
Sheffield Children's Hospital	56	3.78
Royal Hospital for Children Glasgow	57	3.84
Royal Hospital for Sick Children Edinburgh	18	1.21
University Hospital Coventry and Warwickshire	23	1.55
East Lancashire Hospitals NHS Trust	35	2.36
Northern Manchester General Hospital	4	0.27
Addenbrooke's Hospital Cambridge	49	3.30
Swansea Bay University Health Board	2	0.13
Ayrshire and Arran Health Board	4	0.27
Norfolk and Norwich University Hospital	2	0.13
Salisbury NHS Trust	6	0.40
University College London Hospitals	5	0.34
James Paget University Hospital	23	1.55
Kent Community Health	10	0.67
Royal Marsden Trust	6	0.40
Bristol Royal Hospital for Children	21	1.42
Royal Alexandra Children's Hospital Brighton	13	0.88
Tayside Children's Hospital	15	1.01
Royal Aberdeen Children's Hospital	25	1.69
NHS Forth Valley	2	0.13
Royal United Hospitals Bath	16	1.08
Evelina London Children's Hospital	28	1.89
NHS Lanarkshire	47	3.17
University Hospital North Midlands	11	0.74
St Marys Hospital London	3	0.20
Lancashire Teaching Hospital	2	0.13
Kings College Hospital	22	1.48
Poole Hospital	23	1.55
Barts Health NHS Trust	3	0.20

Appendix C: Weekly Questionnaire

sympto	veek beginning xx/xx/xxxx have you expo oms?	· ····· · ···· · ···· · ·····
1.1	I have had no symptoms	O I have had no symptoms O I have had symptoms
1.2	Measured temperature above 38 °C	O Yes O No
1.2.1	If 'Measured temperature above 38 °C' is equal to 'Yes' answer this question: Which days did you measure a temperature above 38 °C?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.2.2	If 'Measured temperature above 38 °C' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.3	Cough	O Yes O No
1.3.1	If 'Cough' is equal to 'Yes' answer this question: Which days did you experience a cough?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.3.2	If 'Cough' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.4	Shortness of breath	O Yes O No
1.4.1	If 'Shortness of breath' is equal to 'Yes' answer this question: Which days did you experience shortness of breath?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday

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		□ Sunday
1.4.2	If 'Shortness of breath' is equal to	O Yes
	'Yes' answer this question:	O No
	Have you experienced a worsening of	
	the above symptom?	
1.5	Sore throat	O Yes
		O No
1.5.1	If 'Sore throat' is equal to 'Yes'	□ Monday
1.0.1	answer this question:	□ Tuesday
	•	
	Which days did you experience sore	□ Wednesday
	throat?	□ Thursday
		🗆 Friday
		Saturday
		□ Sunday
		, ,
1.5.2	If 'Sore throat' is equal to 'Yes'	O Yes
1.0.2	answer this question:	O No
	Have you experienced a worsening of	
	the above symptom?	
1.6	Blocked nose	O Yes
		O No
1.6.1	If 'Blocked nose' is equal to 'Yes'	Monday
	answer this question:	□ Tuesday
	Which days did you experience blocked	□ Wednesday
	nose?	□ Thursday
		□ Friday
	7	□ Saturday
		□ Sunday
1.6.2	If 'Blocked nose' is equal to 'Yes'	O Yes
	answer this question:	O No
	Have you experienced a worsening of	
	the above symptom?	
1.7	Red eyes	O Yes
		O No
1.7.1	If 'Red eyes' is equal to 'Yes' answer	□ Monday
	this question:	□ Tuesday
	•	-
	Which days did you experience red	□ Wednesday
	eyes?	□ Thursday
		🗆 Friday
		□ Saturday
		□ Sunday
1.7.2	If 'Red eyes' is equal to 'Yes' answer	O Yes
1.1.2	this question:	O No
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	Have you experienced a worsening of the above symptom?	
1.8	Headache	O Yes O No
1.8.1	If 'Headache' is equal to 'Yes' answer this question: Which days did you experience headache?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.8.2	If 'Headache' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.9	Joint pain	O Yes O No
1.9.1	If 'Joint pain' is equal to 'Yes' answer this question: Which days did you experience joint pain?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.9.2	If 'Joint pain' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.10	Muscle pain	O Yes O No
1.10.1	If 'Muscle pain' is equal to 'Yes' answer this question: Which days did you experience muscle pain?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.10.2	If 'Muscle pain' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.11	Fatigue	O Yes O No

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1.11.1	If 'Fatigue' is equal to 'Yes' answer	□ Monday
	this question:	□ Tuesday
	Which days did you experience fatigue?	□ Wednesday
		□ Thursday
		□ Friday
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		□ Saturday
		□ Sunday
1.11.2	If 'Fatigue' is equal to 'Yes' answer	O Yes
	this question:	O No
	Have you experienced a worsening of	
	the above symptom?	
1.12	Chills	O Yes
		O No
1.12.1	If 'Chills' is equal to 'Yes' answer this	□ Monday
	question:	🗆 Tuesday
	Which days did you experience chills?	🗆 Wednesday
		□ Thursday
	\sim	□ Friday
		□ Saturday
		□ Sunday
1.12.2	If 'Chills' is equal to 'Yes' answer this	O Yes
	question:	O No
	Have you experienced a worsening of	
	the above symptom?	
1.13	Nausea	O Yes
		O No
1.13.1	🛛 If 'Nausea' is equal to 'Yes' answer 🥔	🗆 Monday
	this question:	Tuesday
	Which days did you experience nausea?	□ Wednesday
		□ Thursday
		□ Friday
		□ Saturday
		□ Sunday
1.13.2	If 'Nausea' is equal to 'Yes' answer	O Yes
	this question:	O No
	Have you experienced a worsening of	-
	the above symptom?	
1.14	Vomiting	O Yes
	Ŭ	O No
1.14.1	If 'Vomiting' is equal to 'Yes' answer	□ Monday
	this question:	□ Tuesday
	Which days did you experience	□ Wednesday
	vomiting?	□ Thursday
		□ Friday

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		□ Saturday □ Sunday
1.14.2	If 'Vomiting' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.15	Diarrhoea	O Yes O No
1.15.1	If 'Diarrhoea' is equal to 'Yes' answer this question: Which days did you experience diarrhoea?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.15.2	If 'Diarrhoea' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.16	Loss of smell or taste	O Yes O No
1.16.1	If 'Loss of smell or taste' is equal to 'Yes' answer this question: Which days did you experience loss of smell or taste?	 ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
1.16.2	If 'Loss of smell or taste' is equal to 'Yes' answer this question: Have you experienced a worsening of the above symptom?	O Yes O No
1.17	Other symptoms	
2.1	Has your child changed medication this week?	O Yes O No
2.1.1	If 'Has your child changed medication this week?" if equal to 'Yes' answer this question: What medication has changed and how?	

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2.2	Was your child in contact with someone who is diagnosed with or suspected to have coronavirus?	O Yes O No O Not known
2.3	Did your child visit the NHS because you were worried about coronavirus infection?	O Yes O No O Not known
2.4	Did your child have a test for coronavirus?	O Yes O No O Not known
2.5	Did your child have a confirmed diagnosis of coronavirus infection?	O Yes O No O Not known
2.6	Was your child admitted to hospital because of a coronavirus infection?	O Yes O No O Not known
2.6.1	If 'Was your child admitted to hospital because of a coronavirus infection?' is equal to 'Yes' answer this question: When was your child admitted?	dd-mm-yyyy
2.6.2	If 'Was your child admitted to hospital because of a coronavirus infection?' is equal to 'Yes' answer this question: How many days was your child admitted?	
2.7	Did you have to self-isolate your child because they had symptoms or because of medical advice related to coronavirus?	O Yes O No O Not known
2.7.1	If 'Did you have to self-isolate your child because they had symptoms or because of medical advice related to coronavirus?' is equal to 'Yes' answer this question: How many days did you self-isolate your child this week?	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
2.8	Were immunosuppressive drugs postponed because of coronavirus infection?	O Yes O No O Not known
2.8.1	If 'Were immunosuppressive drugs postponed because of coronavirus infection?' is equal to 'Yes' answer this question: How many days did you	□ 1 □ 2 □ 3 □ 4

	BMJ Open	
	postpone the immunosuppressants this week?	□ 5 □ 6 □ 7
.9	Did your child miss any sports or fun activities because of the coronavirus pandemic?	O Yes O No O Not known
.9.1	If 'Did your child miss any sports or fun activities because of the coronavirus pandemic?' is equal to Yes answer this question: How many activities did your child miss?	
.10	Did your child miss school because of coronavirus infection?	O Yes O No O Not known
.10.1	If 'Did your child miss school because of coronavirus infection?' is equal to Yes answer this question: How many days of school did your child miss this week?	□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
.11	On a scale of 0-10, how worried are you about coronavirus affecting your child? (0 = not worried, 10 = extremely worried)	
.12	Is there anything that you are particularly worried about that you would like to share?	

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Appendix D:

Symptom frequency by primary diagnosis

Symptoms	JIA (%)	Other rheumatology diagnosis (%)	Airways disease (%)	Immunodeficiency disorder (%)	Diabetes (%)	Solid organ or bone marrow transplant (%)	Nephrotic syndrome (%)	Other kidney disease (%)	IBD (%)	Otिंह्र gastroenterology and hepa⊋logy (%)	Malignant haematology & oncology (%)	Neurology (%)	Othe (%)
Fever	1.63	0.81	0.24	0.73	0.16	0.41	0.08	0.08	0.00	0. 6 8	0.57	0.24	0.33
Cough	4.80	1.54	1.63	1.54	0.24	1.46	0.57	0.16	0.08	0. B D	0.89	0.16	0.65
SOB	1.63	0.89	0.65	0.65	0.08	0.08	0.16	0.08	0.16	0.889 0.860	0.16	0.08	0.81
Sore throat	6.02	2.28	0.98	0.98	0.16	0.41	0.24	0.24	0.49	0.32	0.89	0.33	0.89
Blocked nose	7.48	2.60	1.79	1.30	0.49	1.30	0.65	0.41	0.73	ۿِيەالەھھادى ھۇ مەسىۋەلىكەن ھەسانھە ھەسەنى ھەسانھە ھەسەن ھەسەن ھەسەن ھە مەسەن ھە مەسەن ھە مەسەن ھە مەسەن ھە مەسەن ھەسەن ھەسەن ھەسەن ھە مەسەن ھە مەسە	0.57	0.24	1.22
Red eyes	4.07	2.11	0.57	1.14	0.49	0.41	0.49	0.08	0.33	0.08 0.08	0.57	0.16	0.57
Headache	11.30	4.96	1.30	2.20	0.98	1.54	0.65	0.33	0.98	0.49	1.87	0.73	1.63
Vomiting	3.66	0.89	0.33	0.65	0.08	0.89	0.24	0.24	0.00	크. 0.ᢏ6	1.14	0.08	0.98
Diarrhoea	4.23	1.63	0.57	1.46	0.49	0.81	0.33	0.33	0.81	0.16	0.73	0.24	0.73
Joint pain	19.84	3.98	0.24	1.22	0.16	1.30	0.65	0.24	0.81	0.	1.87	0.41	1.06
Muscle pain	8.46	3.33	0.57	1.22	0.33	1.06	0.65	0.24	0.49	0.j	1.38	0.33	0.81
Fatigue	13.98	4.07	1.30	2.60	0.49	1.30	0.89	0.57	1.30	2024 b땱 guest. Protected by copyright.	3.25	0.89	1.30
Chills	2.11	1.06	0.08	0.49	0.08	0.41	0.08	0.08	0.24	0.56	0.33	0.33	0.24

Symptom frequency by medication

			BMJ Oper	I		/bmjopen-2(
Symptom fr	requency by me	dication				i/bmjopen-2020-044899 on 17			
Symptoms	Methotrexate (%)	Hydroxychloroquine (%)	Other DMARDs (%)	Corticosteroids (%)	Anti-TNF therapy (%)		ilizumab (%)	Other biologic drugs (%)	MMF (%)
Fever	4.92	9.09	0.92	5.62	4.62	021.	4.08	11.11	5.34
Cough	12.44	14.55	9.17	14.06	15.84	Dov	4.08	8.33	15.27
SOB	3.11	3.64	1.83	6.02	4.29	Downloaded from	8.16	5.56	4.58
Sore throat	16.06	21.82	18.35	11.24	18.15	bade	18.37	8.33	10.69
Blocked nose	19.69	25.45	13.76	13.65	23.76	ð fi	14.29	19.44	17.56
Red eyes	12.69	10.91	8.26	10.44	11.55	mo.	14.29	13.89	6.11
Headache	29.27	45.45	29.36	28.11	30.69) T	28.57	27.78	25.19
Vomiting	12.18	9.09	4.59	12.05	8.25	http://bmjopen.bmj.com/	12.24	8.33	7.63
Diarrhoea	9.84	10.91	11.93	11.65	11.88	njo	20.41	8.33	12.98
Joint pain	43.78	43.64	33.03	26.91	46.20	pen	69.39	36.11	22.14
Muscle pain	20.98	41.82	22.02	24.50	21.45	ı.br	30.61	25.00	19.08
Fatigue	39.12	43.64	29.36	34.14	34.65	J. CC	40.82	38.89	24.43
Chills	5.44	12.73	5.50	7.23	6.93		6.12	5.56	6.87
Nausea	31.09	27.27	15.60	20.88	25.41	on /	26.53	16.67	15.27
Loss of smell	0.52	1.82	0.00	0.80	0.33	Apri	0.00	0.00	1.53

Abbreviations: DMARDs disease modifying anti-rheumatic drugs, MMF mycophenolate mofetil

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			BMJ Open			l/bmjopen-2020-0		
Symptoms	Chemotherapy (%)	Azathioprine (%)	Other antibiotics and antivirals (%)	Tacrolimus (%)	Inhalers (%)	44899 0 Insulin (%)	NSAIDs (%)	IV or SC IG (%)
Fever	10.29	7.35	7.14	3.80	8.14	n 3.66	9.72	2.63
Cough	14.71	25.00	18.45	15.19	31.40	₹ 8.54	15.28	13.16
SOB	5.88	8.82	5.95	3.16	16.28	≦ 8.54 arch 3.66	8.33	7.89
Sore throat	8.82	13.24	10.71	6.96	18.60	20 21 20 21 9.76	13.89	0.00
Blocked nose	10.29	16.18	13.69	14.56	36.05		25.00	10.53
Red eyes	10.29	8.82	9.52	5.70	15.12	9.76	16.67	5.26
Headache	27.94	32.35	20.83	18.35	32.56	no 25.61	44.44	15.79
Vomiting	22.06	10.29	14.29	8.86	12.79	ad 7.32	9.72	5.26
Diarrhoea	14.71	10.29	13.10	10.13	12.79	d f 10.98	12.50	5.26
Joint pain	29.41	14.71	20.24	17.09	18.60	B 8.54	61.11	18.42
Muscle pain	23.53	11.76	17.26	14.56	19.77	7.32	31.94	7.89
Fatigue	47.06	30.88	30.36	18.35	30.23	Downloaded from http://bmjopen 10.98	54.17	18.42
Chills	7.35	2.94	4.17	3.80	6.98	1.22	11.11	0.00
Nausea	30.88	19.12	17.86	12.66	20.93	10.98	27.78	10.53
Loss of smell	0.00	0.00	0.00	1.27	1.16	0.00	4.17	0.00

Abbreviations: NSAIDs non-steroid anti-inflammatory drugs, IV intravenous, SC subcutaneous, IG immunoglobulin

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STROBE Statement—Checklist of items that should be included in reports of cohort studies

	Item No	Recommendation	Pag No
Title and abstract	1	(<i>a</i>) Indicate the study's design with a commonly used term in the title or the abstract	2
		(<i>b</i>) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			·
Study design	4	Present key elements of study design early in the paper	4-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of	4-6
Dantiainanta	(recruitment, exposure, follow-up, and data collection	4-6
Participants	6	(<i>a</i>) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	
		(b) For matched studies, give matching criteria and number of exposed and	
		(b) For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and	4-6
v unuoios	,	effect modifiers. Give diagnostic criteria, if applicable	
Data sources/	8*	For each variable of interest, give sources of data and details of methods of	4-6
measurement		assessment (measurement). Describe comparability of assessment methods if	
		there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	4-6
Study size	10	Explain how the study size was arrived at	4-6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4-6
Statistical methods	12	(<i>a</i>) Describe all statistical methods, including those used to control for	4-6
Statistical methods	12	confounding	
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	
		(d) If applicable, explain how loss to follow-up was addressed	
		(<u>e</u>) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially	6
1		eligible, examined for eligibility, confirmed eligible, included in the study,	
		completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social)	6-8
		and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) Summarise follow-up time (eg, average and total amount)	<u> </u>
Outcome data	15*	Report numbers of outcome events or summary measures over time	6-8

Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their	
		precision (eg, 95% confidence interval). Make clear which confounders were adjusted for	
		and why they were included	
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a	
		meaningful time period	
Other analyses	17	Report other analyses done-eg analyses of subgroups and interactions, and sensitivity	
		analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision.	
		Discuss both direction and magnitude of any potential bias	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations,	
		multiplicity of analyses, results from similar studies, and other relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	
Other information	on		
Funding	22	Give the source of funding and the role of the funders for the present study and, if	

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

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