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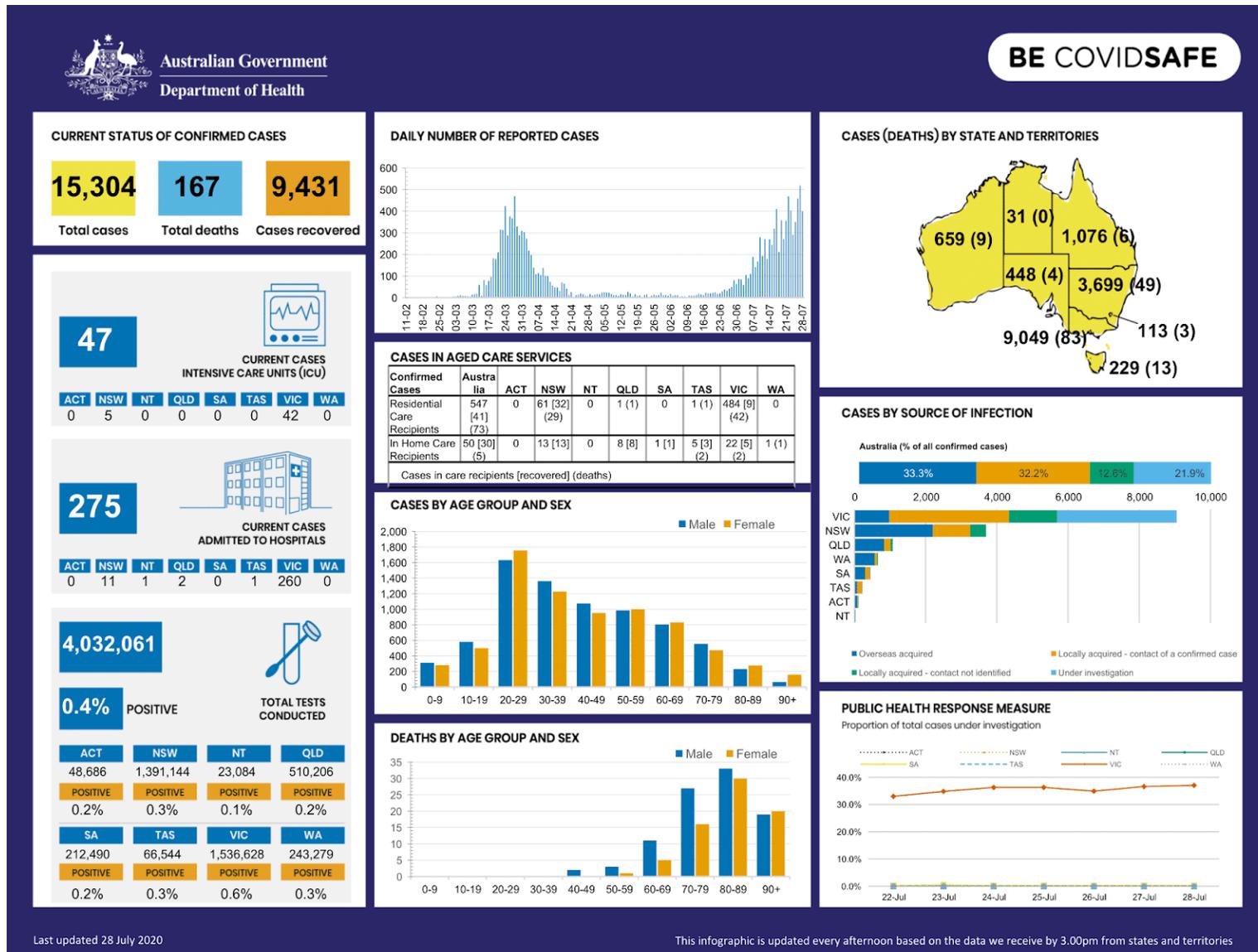
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# COVID-19 KIDS RESEARCH EVIDENCE UPDATE

WHAT THE MELBOURNE  
CHILDREN'S CLINICIANS,  
SCIENTISTS, EPIDEMIOLOGISTS,  
AND MEDICAL STUDENTS HAVE  
BEEN READING THIS WEEK

**Weekly Update No. 15**

30<sup>th</sup> July 2020



Source: Australian Government: Department of health [Internet]. 2020 [updated 2020 July 28; cited 2020 July 29]. Available from: <https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-current-situation-and-case-numbers-at-a-glance>

# GUEST EDITORIAL

A/Prof Margie Danchin - Murdoch Children's Research Institute,  
The University of Melbourne and The Royal Children's Hospital

Welcome to the 15th Edition of the weekly report and a huge thank you to the team who continue to source the most interesting and relevant articles and updates for us all, particularly to support our focus on the clinical care of women and children during COVID-19. With the astounding pace of publication around COVID research and articles, we hope you enjoy the presentation of this week's highlights.

At this stage of the pandemic in Australia, the debate around masks has intensified, and they have now become mandatory in metropolitan Melbourne and Mitchell Shire under the Stay at Home directions issued by the Department of Health. Face coverings continue to be recommended in regional Victoria and other parts of the country in situations where maintaining 1.5 metres distance is not possible. For many people, wearing a mask is difficult or not possible, due to medical, behavioural or other reasons, and for others, it has raised issues about impinging on their rights. The discussions around school closures continue, with reports of school outbreaks occurring (see [https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.29.2001352?emailalert=true#html\\_fulltext](https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.29.2001352?emailalert=true#html_fulltext)) but with a more moderate approach being taken despite high cases numbers in Victoria. Highlighted this week, there are some wonderful new resources for children about communicating with them about COVID-19 (see [https://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099\(20\)30626-5.pdf](https://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099(20)30626-5.pdf)) and guidance around what to do at home during times of quarantine as the reality of the likely duration of the pandemic sets in (see [https://healthsciences.unimelb.edu.au/\\_data/assets/pdf\\_file/0009/3357099/Quarantine-Guide-for-Adults-by-Children.pdf](https://healthsciences.unimelb.edu.au/_data/assets/pdf_file/0009/3357099/Quarantine-Guide-for-Adults-by-Children.pdf)).

Since the start of the COVID-19 pandemic, there has been a substantial global investment and race to produce a safe and effective COVID-19 vaccine, with over 180 vaccines in development currently and **26 in phase I/II and 4 in phase 3** clinical trials. With the promising trial results last week on the Oxford Vaccine (ChAdOx1 nCoV-19) (see [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)31604-4/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)31604-4/fulltext)), it is now looking more likely that we may have one or more COVID-19 vaccines by 2021. However, concerns have been raised about the duration of humoral immunity in people with mild illness, who compose the majority of people with COVID-19 (see <https://www.nejm.org/doi/full/10.1056/NEJM2025179?source=nejmtwitter&medium=organic-social>), which has important implications for vaccine durability and will be an important focus of ongoing research.

But now the question is, will the public accept the COVID-19 vaccines? Data from the U.S. and France suggest that approximately a quarter of people may refuse a COVID vaccine, although predicted acceptance looks a bit higher in Australia (see [https://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099\(20\)30559-4.pdf](https://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099(20)30559-4.pdf)).

The main concerns will centre around vaccine safety, with the expedited timelines of the vaccines compared to traditional vaccine development, but vaccine sentiment is likely to be highly dependent on the phases of the pandemic and when disease rates and community transmission are highest. As has been shown in previous mass vaccination programs, community engagement and planning for vaccine program rollout needs to begin now to optimise vaccine confidence and uptake in Australia, not when the vaccines become available (<https://jamanetwork.com/journals/jama/fullarticle/2766370>). WHO and the U.S. Centre for Disease Control (CDC) Advisory Committee on Immunisation Practice (ACIP) have advised a risk and age-based approach for prioritisation of COVID-19 vaccine target groups, with priority for healthcare workers and individuals at highest medical risk, such as those with chronic medical comorbidities. However, members of the general population at risk due to socioeconomic vulnerability and/or specific communication and engagement requirements will also need to be carefully considered.

It is clear that public health officials and policymakers must prioritise effective COVID-19 vaccine-acceptance messaging through community engagement now to inform effective risk communication. WHO intends to finalise the vaccine prioritisation plan by August 2020 as more data on the burden of COVID-19 becomes available, when other groups may be prioritised. Other groups may include pregnant women, for example, with more data becoming available identifying them as a potentially high-risk group. However, as highlighted this week, (see <https://www.nature.com/articles/s41390-020-1067-3>) exclusion of pregnant women and children from trials may put them at risk when vaccines tested on the non-pregnant adult population become available and are potentially offered on compassionate grounds without any evidence base.

Currently, of the 250 registered drug and vaccine intervention trials, 80% exclude children or pregnant women. It seems a clear imperative that inclusion of children and pregnant women in COVID-19 intervention trials should be promoted, so that intervention trials fairly benefit all people.

Happy reading and watch this space!

# HIGHLIGHTS

- > Aerosol transmission of SARS-CoV-2 is possible.
- > Likely to be safe to allow the mother-infant relationship to develop with adequate hygiene measures in place in COVID-19 cases.
- > Important role of the Australian Breastfeeding Association (ABA) in providing remote support/advice to mothers during the COVID-19 pandemic.
- > COVID-19 mental health research priorities identified by an expert panel convened by the British Psychological Society.
- > Virtual maternal and infant home visits provide an essential connection to support families.
- > Communicating COVID-19 to children: Three books that explain COVID-19 to younger children.
- > If you are home-schooling at the moment, a guidebook for adults written by Aboriginal, non-Aboriginal and Turkish children, provides some tips.
- > Secondary school outbreak in Israel likely due to combination of extreme heat leading to no mask wearing and air conditioning use, and mixing, large classroom sizes, after hours activities and school transport.
- > Among patients hospitalised with mild-to-moderate COVID-19, the use of hydroxychloroquine, alone or with azithromycin, did not improve clinical status at 15 days as compared with standard care.
- > Importance of including children and pregnant women in COVID-19 intervention trials so that intervention trials fairly benefit all people.
- > Complexity of mitigation approaches in low and middle income countries when physical distancing and working from home are not feasible.
- > Concern from Indian obstetricians about indirect effects of COVID-19 on maternal health and urgent need to encourage pregnant women to seek care and the need for improved referral systems.
- > Weblink providing a snapshot of adolescent experiences of COVID-19.
- > Viral load similar across all age ranges in symptomatic COVID-19 cases in the first five days of symptoms.
- > Concerns that humoral immunity against SARS-CoV-2 may not be long lasting in persons with mild COVID-19.
- > Applying masks to patients can reduce infectious aerosol exposure to health care workers.

- > A national consensus pathway for the U.K. has been developed for children suspected of having the novel syndrome PIMS-TS.
- > Some evidence in Germany of increased diabetic ketoacidosis seen in newly diagnosed type 1 diabetes in children, during the COVID-19 pandemic.
- > 17% of 451 children with laboratory-confirmed SARS-CoV-2 admitted to hospitals across the U.K. required critical care.

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# CHILD DEVELOPMENT

Professor Fiona Russell - Director of Child and Adolescent Health PhD program, Department of Paediatrics, The University of Melbourne: Group Leader, Asia-Pacific Health Research, MCRI

## **Communicating with children about COVID-19**

[https://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099\(20\)30626-5.pdf](https://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099(20)30626-5.pdf)

- > Describes three books that explain COVID-19 to younger children — including how the virus is transmitted, the importance of following social distancing measures, and the effects of the virus.
- > My Hero Is You: How kids can fight COVID-19, which tells the story of a girl who travels with a dragon to watch children around the world, making a difference by following simple rules. The book was developed with input from global experts, parents and carers, teachers, and children themselves in 104 countries, and to date has been released in Arabic, Chinese, French, Russian, and Spanish.

## **What to do at home during times of quarantine**

[https://healthsciences.unimelb.edu.au/\\_data/assets/pdf\\_file/0009/3357099/Quarantine-Guide-for-Adults-by-Children.pdf](https://healthsciences.unimelb.edu.au/_data/assets/pdf_file/0009/3357099/Quarantine-Guide-for-Adults-by-Children.pdf)

- > If you are home-schooling at the moment, a guidebook for adults written by Aboriginal, non-Aboriginal and Turkish children

# CLINICAL PAEDIATRICS

Julian Loo Yong Kee - 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

## **Ketoacidosis in children and adolescents with newly diagnosed type 1 diabetes during the COVID-19 pandemic in Germany**

[https://jamanetwork.com/journals/jama/fullarticle/2768716?guestAccessKey=d7157cde-acc6-4cc0-9846-f874b19b351e&utm\\_source=silverchair&utm\\_medium=email&utm\\_campaign=article\\_alert-jama&utm\\_content=olf&utm\\_term=072020](https://jamanetwork.com/journals/jama/fullarticle/2768716?guestAccessKey=d7157cde-acc6-4cc0-9846-f874b19b351e&utm_source=silverchair&utm_medium=email&utm_campaign=article_alert-jama&utm_content=olf&utm_term=072020)

- > Data regarding 532 children and adolescents from the German Diabetes Prospective Follow-up Registry (DPV) of children and adolescents diagnosed with type 1 diabetes between 13<sup>th</sup> March and 13<sup>th</sup> May 2020.
- > Increased frequency of diabetic ketoacidosis (DKA) and severe DKA during the COVID-19 pandemic compared to the same time period in the previous two years, with children < 6 years old being at the highest risk and having the greatest increase.
  - DKA up to 18 years: 44.7% in 2020; 24.5% in 2019; 24.1% in 2018
    - Children < 6 years: 51.9% in 2020; 18.4% in 2019; 24.2% in 2018
  - Severe DKA up to 18 years: 19.4% in 2020; 13.9% in 2019; 12.3% in 2018
    - Children < 6 years: 24.4% in 2020; 12.2% in 2019; 11.7% in 2018
- > Limitations: Individual socioeconomic status and family history of diabetes were unavailable.
- > Further research into the possible causes of increased DKA during the COVID-19 pandemic and interventions to reduce DKA are required.

Reviewed by: Dr Martin Wright

Samar Hikmat – 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

**Clinical characteristics of children and young people hospitalised with COVID-19 in the United Kingdom (not peer reviewed)**

<https://www.medrxiv.org/content/10.1101/2020.07.14.20153320v1?%253fcol=lection=>

- > A prospective multicentre observational cohort study involving 451 children (age < 19 years), with laboratory-confirmed SARS-CoV-2, admitted to 116 hospitals across the U.K. between 17<sup>th</sup> January and 5<sup>th</sup> June 2020.
- > Findings were as follows:
  - Demographics: median age: 3.9 years, predominantly male (57%) and of White ethnicity (56%).
  - Most common presenting symptoms were fever, cough, shortness of breath, nausea and vomiting.
  - Most children had no comorbidities but when present, the most common were neurological, haematological, oncological, immunological, and cardiac.
  - 17% required critical care. Critical care admission was associated with age < 1 month, age 10-14 years, black ethnicity and presence of comorbidities.
  - 83% of children were discharged alive, 17% continued to receive care, and three children died. All three children who died were between 16-19 years and had comorbidities (two with profound disability and pre-existing respiratory compromise, and one immunosuppressed by chemotherapy for malignancy).
  - Symptom clusters were muco-enteric, and respiratory, with little overlap between muco-enteric and lower respiratory.
  - 12% (36/303) met the WHO preliminary criteria for Multisystem Inflammatory Syndrome in Children and Adolescents (MIS-C).
    - Characterised by:
      - Fever for  $\geq 3$  days.
      - Plus two of the following:
        - Rash or bilateral non-purulent conjunctivitis or muco-cutaneous inflammatory signs.
        - Hypotension or shock.
        - Features of myocardial dysfunction, pericarditis, valvulitis, or coronary abnormalities.
        - Evidence of coagulopathy.
        - Acute G.I. problems (diarrhoea, vomiting or abdominal pain).
    - Plus elevated inflammatory markers.

- Plus no obvious microbial cause of inflammation.
- The first patient with MIS-C was admitted 19<sup>th</sup> March (first case report was not until over a month later).
- Compared to children with no MIS-C, those with MIS-C were more likely to:
  - Present with headache, myalgia, lymphadenopathy, sore throat and fatigue in addition to the WHO clinical criteria.
  - Have lower platelet and lymphocyte count but higher neutrophil counts and higher creatinine.
  - Be admitted to critical care.
    - No deaths were seen in this group.
    - Those children were older and more likely to be of non-White ethnicity.
    - MIS-C is likely the severe end of the mucro-enteric cluster.
- Limitations include over-representation of subjects from tertiary paediatric centres, only 53% of all hospitalisations of a child SARS-CoV-2 positive included, and that comorbidity variables were not tailored to children.

Reviewed by: Dr Martin Wright

Benjamin Watson – 4th Year Medical Student,  
Department of Paediatrics, The University of Melbourne

**The immunology of multisystem inflammatory syndrome in children with COVID-19 (not peer reviewed)**

<https://www.medrxiv.org/content/10.1101/2020.07.08.20148353v1>

- > A complication of SARS-CoV-2 infection in Italian children is the rare Multisystem Inflammatory Syndrome in Children (MIS-C), presenting 4-6 weeks after infection as high fever and organ dysfunction and strongly elevated markers of inflammation.
- > The pathogenesis is unclear but has overlapping features with Kawasaki disease suggestive of vasculitis and a likely autoimmune aetiology.
- > The authors compared the blood immune cells, cytokines, and autoantibodies in 12 healthy children, 28 children with Kawasaki disease enrolled prior to COVID-19, and 44 children infected with SARS-CoV-2, of whom four children presented with MIS-C; all enrolled to the one specialist children's hospital in Italy.
- > Hyperinflammation in MIS-C differs from that of acute COVID-19 in adults (a cytokine storm).
- > T-cell subsets discriminate Kawasaki disease patients from MIS-C.
- > IL-17A drives Kawasaki, but not MIS-C hyperinflammation.

- > Higher levels of biomarkers associated with arteritis and coronary artery disease in Kawasaki disease, suggesting a more diffuse endothelial involvement and immunopathology in MIS-C.
- > Autoantibodies to Endoglin were elevated in MIS-C and a subset of Kawasaki patients.

Reviewed by: Dr Martin Wright

**A national consensus management pathway for Paediatric Inflammatory Multisystem Syndrome - Temporally associated with SARS-CoV-2 (PIMS-TS): The results of a national Delphi process (not peer reviewed)**

<https://www.medrxiv.org/content/10.1101/2020.07.17.20156075v1.full.pdf>

- > A national consensus pathway for the U.K. has been developed for children suspected of having the novel syndrome PIMS-TS in a timely, cost-efficient manner, in the midst of a global pandemic.
- > Use of a rapid online Delphi process has made this consensus process possible within six weeks of the need being identified.
- > The pathway includes (Please read the article for a detailed breakdown of management pathway):
  - RCPCH Definition of Paediatric Inflammatory Multisystem Syndrome Temporally Associated with SARS-CoV-2 (PIMS-TS).
  - Initial investigation of children with suspected PIMS.
  - Haematological and biochemical investigation of children who meet the criteria for PIMS.
  - Additional investigations for children who meet the criteria for PIMS.
  - Classification of PIMS.
  - Location of care and features of severity of PIMS.
  - Multi-Disciplinary Team.
  - Discharge criteria and follow-up.
  - Anti-viral and antibiotic therapy.
  - Management of children with PIMS and features of Kawasaki-like Disease (Complete and incomplete phenotype).
  - Management of children with PIMS and non-specific presentation phenotype.
  - Anti-platelet and anti-coagulation therapy for children with PIMS.
  - RECOVERY trial.
  - References and resources for guidance.

Reviewed by: Dr Martin Wright

# CLINICAL TRIALS

Rose Noble Kizhakekara - 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

**Inclusion of children and pregnant women in COVID-19 intervention trials**  
<https://www.nature.com/articles/s41390-020-1067-3>

- > A manual search of the inclusion and exclusion criteria of 250 registered drug and vaccine intervention trials revealed that over 80% of these trials exclude children or pregnant women.
- > Justification of exclusion of children and pregnant women only holds if the risk-benefit ratio is high. For example, if there is no medical benefit to pregnant women, and there is a known or plausible significant risk of the studied intervention to the foetus.
- > Excluding children and pregnant women from trials may put them at risk when medications tested on the non-pregnant adult population are used off-label and on compassionate grounds without any evidence base.
- > Another problem is that potential life-saving interventions may be denied to children and pregnant women in severe cases such as severe pneumonia or ARDS.
- > Moreover, there will be a delay in accessing treatment if researchers simply wait for the completion of animal-reproduction studies or studies in the adult non-pregnant population.
- > The authors argue in this comment piece that the inclusion of children and pregnant women in COVID-19 intervention trials should be promoted, so that intervention trials fairly benefit all people. Guidelines of ethical research should be followed, respecting the autonomy of pregnant women and mature minors to provide informed consent.

Reviewed by: Professor Fiona Russell

# DIAGNOSTICS & SAMPLING

Renee Cocks- 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

## **A SARS-CoV-2 surrogate virus neutralisation test based on antibody-mediated blockage of ACE2-spike protein-protein interaction**

<https://www.nature.com/articles/s41587-020-0631-z>

- > A robust serological test to detect neutralising antibodies that block the entry of SARS-CoV-2, is important to determine the infection rates, long term immunity and vaccine efficacy. The current conventional virus neutralisation test (cVNT) requires a live virus, biosafety level (BSL) 3 laboratory and takes 2-4 days to complete. Hence cVNT accessibility and widespread use are limited.
- > This study reports a newly designed, simple, easy use of a SARS-CoV-2 surrogate virus neutralisation test (sVNT) that detects total immunodominant neutralising antibodies targeting the viral spike (S) protein receptor-binding domain in an isotype and species independent manner with 99.93% specificity and 95–100% sensitivity.
- > This new test:
  - Uses purified receptor-binding domain (RBD) from the S protein and the host cell angiotensin-converting enzyme 2 (ACE2) receptor protein to mimic the virus-host interaction in an ELISA well. The RBD-ACE2 interaction can be neutralised (blocked) by specific neutralising antibodies in the patient or animal sera in the same manner as in cVNT (using live SARS-CoV-2 virus) or in pseudo-viral neutralisation test (using pseudo- SARS-CoV-2 virus).
  - Can be performed in BSL-2 labs and within 1-2 hours.
- > The specificity of the test was demonstrated on:
  - A panel of convalescent sera from COVID-19, SARS-CoV-1, seasonal coronavirus (CoV 229/NL63 and CoV OC43) and healthy control.
  - 15 monoclonal antibodies from four different non-human species.
  - Animal sera (ferrets, rabbits, mice).
  - Validation of the test was demonstrated on clinical samples from cohorts from two countries.
- > Results:
  - The sVNT was isotype and species-independent. sVNT can detect total RBD-targeting antibodies.
  - The sVNT has 99.93% specificity and 95–100% sensitivity, no cross-neutralisation signals observed from sera of patients infected with SARS, MERS and other seasonal coronaviruses.

- The sVNT demonstrated a good correlation with two other virus neutralising tests (conventional and pseudovirus-based) on a panel of 60 COVID-19 sera with different levels of SARS-CoV-2 neutralising antibodies.
- With a cut-off of 30% inhibition, the sVNT demonstrated
  - 100% specificity and 98.9% sensitivity when tested 175 sera from patients with PCR confirmed SARS-CoV-2 in Singapore, collected on days 14-33 after symptom onset and 200 healthy control sera.
  - 100% specificity and 98% sensitivity when tested 50 sera from patients with PCR confirmed SARS-CoV-2 in Nanjing, China, collected on days 27-61 after symptom onset and 200 healthy control sera.
- > Significance: Provides a simple, rapid viral neutralisation test that can be broadly accessible to the wider community for both research and clinical applications. The test can detect SARS-CoV-2 antibodies in a species-independent manner, which is ideal for virus hunting in reservoir/intermediate animal tracking.
- > Limitations: Will never completely replace the conventional viral neutralisation test which can explore the neutralising antibodies against different virus strains.

Reviewed by: Dr Lien Anh Ha Do

# EPIDEMIOLOGY & PUBLIC HEALTH

Professor Fiona Russell - Director of Child and Adolescent Health PhD program, Department of Paediatrics, The University of Melbourne: Group Leader, Asia-Pacific Health Research, MCRI

## **Why 6 feet may not be enough social distance to avoid COVID-19**

<https://www.sciencenews.org/article/coronavirus-covid-19-why-6-feet-may-not-be-enough-social-distance>

- > Nice lay summary on the evidence of physical distancing.
- > Mounting evidence suggests SARS-CoV-2 is airborne, so people could be infected simply by inhaling the virus in tiny aerosol droplets exhaled by someone talking or breathing.
- > What is actually a safe physical distance to be apart is unknown.
- > It may depend on many factors, including whether people are inside or outdoors, how loudly people are speaking, whether they are wearing masks, how well-ventilated a room is and how far the virus can really fly.
- > Summarises big droplet spread and importance of hand hygiene; and what is known about small droplets (aerosol) spread and the importance of masks.

Grace Newman – 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

## **State wide implementation of virtual perinatal home visits during COVID-19**

<https://link.springer.com/article/10.1007/s10995-020-02982-8>

- > Florida Maternal, Infant and Early Childhood Home Visiting Initiative (MIECHV) provide perinatal home visiting support to pregnant women and families with infants in high need communities in Florida. As a result of COVID-19 they have had to modify home visiting operations transitioning to virtual operations, virtual home visits and telehealth.
- > Method: evaluation with statewide MIECHV staff survey and weekly focus groups. The analysis focused on domains of MIECHV workforce wellbeing, family needs, and virtual MIECHV services.
- > Results: 60 surveys from supervisors/administrators (17), home visitors (38) and others (5) collected in the first two weeks of April with 80% responding positively about virtual visits. Nine weekly state-led focus groups.

- > Discussion:
  - Family engagement and support from MIECHV and other agencies, in addition to communication and resource sharing amongst staff important.
  - Barriers included being unable to observe parent-child relationship, difficulty familiarising clients to virtual software, lack of efficient internet service, benchmark expectations, anxiety and uncertainty due to the pandemic
  - Families are experiencing unique needs due to the pandemic, including financial assistance, parenting support, accessible mental health services, transportation and housing.
  - Home virtual visits have been providing resources, supplies, public health education and support that families may not have otherwise had knowledge or means to access.
  - Resources needed to assist implementation of virtual home visits included easy access to required documents from home, tips and activities for conducting the visits, self-care activities, and video-conferencing equipment.
  - Reducing all barriers to providing financial assistance and supplies to help families with the most basic needs would be helpful.
  - The program continues to assist families virtually and is able to address their needs with individualised support and allows the continuation of communication with families.
  - Continued virtual supports could have a role as an augmentation to in-person home visiting or as a hybrid format.
  - Virtual home visits provide an essential connection to support for families.

Reviewed by: Professor Fiona Russell

Chan Ying Zhen Charissa - 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

**Contact tracing during coronavirus disease outbreak, South Korea, 2020**

[https://wwwnc.cdc.gov/eid/article/26/10/20-1315\\_article?deliveryName=USCDC\\_333-DM33334](https://wwwnc.cdc.gov/eid/article/26/10/20-1315_article?deliveryName=USCDC_333-DM33334)

- > Effective contact tracing is a key component in the strategy to control the spread of COVID-19. This article describes the contact tracing program in South Korea.
- > The index case was the first laboratory-confirmed or documented case within a cluster.
- > Contacts in high-risk groups were routinely tested. In non-high-risk groups, only symptomatic persons were tested. Non-high-risk asymptomatic contacts had to self-quarantine for 14 days.
- > All index patients were eligible for inclusion in this analysis if >1 contact was identified.
- > Observed 59,073 contacts of 5,706 COVID-19 index patients for 9.9 (range 8.2–12.5) days.
- > Overall, 11.8% of 10,592 household contacts had COVID-19.

- Rates of COVID-19 were higher for contacts of children than adults.
- Contacts of index school age children (10-19 years old) had the highest rate of COVID-19 [18.6% (14.0–24.0%)].
- > Overall, 1.9% of 48,481 non-household contacts tested positive for SARS-CoV-2.
  - Detection rates were higher for contacts of index patients older than 40 years of age.
- > The study was conducted during the period when active public health COVID-19 mitigation strategies and school closures were in place. Higher household than non-household detection might partly reflect transmission when family members stayed home, possibly creating spread within households.
- > Limitations: number of cases may be underestimated due to unidentified asymptomatic patients. Detected cases may have resulted from exposure outside the household. The actual difference in transmissibility between household and non-household settings cannot be assessed because of different thresholds for testing contacts in the two groups.

Reviewed by: Dr Claire von Mollendorf

Alastair Weng – 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

**Changes in premature birth rates during the Danish nationwide COVID-19 lockdown: a nationwide register-based prevalence proportion study (not peer reviewed)**

<https://www.medrxiv.org/content/10.1101/2020.05.22.20109793v1>

The authors compared the rates of premature birth during the period of 12<sup>th</sup> March to 14<sup>th</sup> April, 2020 with the same period in five previous years (2015-2019) to determine if there was any association between lockdown and premature births.

- > The study was a nationwide prevalence proportion study using the Danish National Screening Biobank database which provides accurate information on pregnancies in Denmark.
- > Denmark experienced a strict nationwide lockdown from 12<sup>th</sup> March to 14<sup>th</sup> April, with the gradual lifting of restrictions following this period.
- > Included a total of 31,180 live singleton infants born from 12<sup>th</sup> March to 14<sup>th</sup> April, during 2015 to 2020.
- > The total number of singleton births during the lockdown in 2020 (n = 5,162) did not differ from the other years (mean births per year 5,203.6, SD ± 221.4; p=0.24).
- > There were 1,566 premature births (gestational age below 37 weeks) in total from singleton pregnancies (5.02 %).
- > The rate of extremely premature births (<28/40) was significantly lower in 2020 (0.19/1000 live births) compared with the average rate in the preceding 5 years (2.19/1000 live births). The very premature group rate (28-32/40) was slightly higher in the lockdown group (6.20 vs 5.57/1000 live births), but this was not significant. No significant differences were found in the late preterm and term groups.

- > The authors hypothesised that a reduction in factors which influence the inflammatory state in pregnant women (improved hygiene, physical distancing, home rest), and a decrease in air pollution during lockdown may play a role in the decrease in extremely premature births observed in this period. Not clear why reduction was not seen in less premature births.
- > This study is observational and the association between the decreased number of extremely premature births and nationwide lockdown is not necessarily causal.
- > Future studies should confirm this finding and try to identify potential causal factors.

Reviewed by: Dr Claire von Mollendorf

## Natalie Commins - 3rd Year Medical Student, Department of Paediatrics, The University of Melbourne

### **A large COVID-19 outbreak in a high school 10 days after schools' reopening, Israel, May 2020**

[https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.29.2001352?emailalert=true#html\\_fulltext](https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.29.2001352?emailalert=true#html_fulltext)

- > This article details a large COVID-19 outbreak in Israel after the reopening of schools.
- > Israel closed all educational facilities on the 13<sup>th</sup> March with the limited reopening of some facilities on 3<sup>rd</sup> May (kindergarten, grades 1-3 and 11-12).
- > The rest of the facilities opened on the 17<sup>th</sup> May with hygiene, social distancing and facemask requirements.
- > Ten days after full reopening, a large COVID-19 outbreak occurred in a high school.
  - Two cases unrelated to each other in the same school.
  - The school children and staff were later tested - 153 students (13.2%) and 25 staff members (16.6%) returned positive results.
  - There was a total of 260 cases linked to the school outbreak, including students, staff, relatives and friends.
- > Characteristics of the school at the centre of the outbreak.
  - Regional public school with crowded classes (35-38 students) and less than the recommended 1.5 m<sup>2</sup> between students.
  - The school is one large building with separate wings for junior and senior students, shared amenities.
  - Separate air conditioning for each class.
  - An extreme heatwave occurred for three days (19<sup>th</sup>-21<sup>st</sup> May), and masks weren't worn during this period.
  - The two students who originally contracted COVID-19 attended during this period with mild symptoms.

- > Rates of infection were higher in junior students (years 7-9) than senior students.
- > Of the COVID-19 cases linked to these outbreaks, symptoms were reported by 43% of students and 76% of staff.
- > The rates of children infected in Jerusalem also increased from a baseline of around 19.8% to 40.9% after the reopening of schools.
- > Extracurricular activities after school, community events and travel via bus to school are likely to have contributed to the spread of COVID-19 in this outbreak.
- > Recommendations: small student groups, minimise student mixing in activities and transport to school, consider outdoor classes and online learning.

Reviewed by: Dr Celeste Donato

# GLOBAL HEALTH

## WHO situation report 190

[https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200728-covid-19-sitrep-190.pdf?sfvrsn=fec17314\\_2](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200728-covid-19-sitrep-190.pdf?sfvrsn=fec17314_2)

## Burnet COVID-19 Global Trends & Analyses: July update 2

[https://burnet.edu.au/system/asset/file/4136/7.2\\_Know\\_C-19\\_Hub\\_Global\\_Analysis\\_July-24.pdf](https://burnet.edu.au/system/asset/file/4136/7.2_Know_C-19_Hub_Global_Analysis_July-24.pdf)

## Adolescent experiences of COVID-19

<https://www.gage.odi.org/adolescent-experiences-of-covid-19/>

Chan Ying Zhen Charissa - 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

## COVID-19 outbreak and decreased hospitalisation of pregnant women in labour

<https://www.sciencedirect.com/science/article/pii/S2214109X20303193?via%3Dihub>

- > Retrospective analysis of pregnant women in Western India during the lockdown.
  - Lockdown period: 25<sup>th</sup> March to 2<sup>nd</sup> June 2020.
  - Control period: 15<sup>th</sup> January to 24<sup>th</sup> March 2020.
- > Findings suggest an increase in the number of unattended deliveries and those at lower-level facilities.
- > 43.2% reduction in hospitalisation in lockdown period than control.
- > 49.8% reduction in hospitalisation in lockdown period than 2019.
- > 66.4% reduction in referred obstetric emergencies.
- > 37% underwent caesarean section in lockdown period as compared to 33% in the control period.
- > Compared with the pre-lockdown group, women delivering in the tertiary facilities after lockdown was more likely to be literate (64.4 vs 61.4%) and primigravidae (59.0 vs 44.0%).
- > Significantly increased in-hospital mortality among pregnant women (0.20 vs 0.13%) and late intrauterine foetal death and stillbirth (3.15 vs 2.25%) during the post-lockdown period, compared with the pre-lockdown period.
- > The authors presume that many women with a complicated pregnancy have died at peripheral centres, waiting too long for timely referral.
- > Urgent need for educational campaigns to address patients' apprehension, and to convey that it is safe to come to the hospital for emergency obstetric care, which if untreated, has a higher morbidity and mortality rate compared with COVID-19. Secure treatment pathways for the care of pregnant women along with the provision of an adequate number of emergency ambulances for an urgent referral is needed.

Reviewed by: Professor Fiona Russell

Batsho Mandlebe - 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

**Will the higher-income-country blueprint for COVID-19 work in low- and middle-income countries?**

<https://www.ghspjournal.org/content/ghsp/8/2/136.full.pdf>

- > The current blueprint against COVID-19 in higher-income countries (HICs) works in two phases:
  - Phase 1 - 'Flatten the curve' by implementing lockdown policies to aggressively suppress the effective reproduction number ( $R_0$ ) and therefore avoid a surge in hospital demand while equipping intensive care units with the appropriate resources.
  - Phase 2 – maintain a reduction in  $R_0$  by 'social distancing' and adopt a rapid response to positive case management and contact tracing.
- > By implanting a HIC approach in low- and middle-income countries (LMICs), potential disadvantages include:
  - The national spread of COVID-19 due to retrenched city dwelling workers returning to their villages as well as the return of the LMIC diaspora from HICs.
  - Disruptions to employment and food services are jeopardising 500 million new people living in poverty.
  - The lack of access to education due to limited online services.
  - Disruptions to medication availability and delivery of routine time sensitive clinical aid.
  - A reduction in the use of primary health care for preventative management.
  - Disruptions to immunisation services leading to outbreaks and deaths of preventable diseases.
- > HICs and LMICs differ in their age distribution, stability and state and structural resources. Therefore, the priorities for the COVID-19 pandemic management in LMICs may include the following:
  - Limiting the spread of COVID-19 by recommending locally appropriate physical distancing measures, eliminating super spreading mass gatherings and congested habitations and implementing robust testing, tracing and isolating measures to minimise population wide lockdowns.
  - Mitigate harm by keeping food and health systems in operation while communicating honestly and consistently to healthcare workers and the wider population about the pandemic.
  - Shield those at high risk (i.e. the elderly who often reside in multigenerational homes) by limiting social networks and adopting more vigorous physical distancing for the co-habitants.
- > Overall, a succinct but comprehensive analysis of the contrasting issues.

Reviewed by: Professor Steve Graham

# IMAGING

Jenny Pham - 4th Year Medical Student,  
Department of Paediatrics, The University of Melbourne

## **Spectrum of imaging findings on chest radiographs, U.S., CT, and MRI images in Multisystem Inflammatory Syndrome in Children (MIS-C) associated with COVID-19**

<https://pubs.rsna.org/doi/10.1148/radiol.2020202543>

- > Retrospective review of imaging findings of 35 children, median age of 11, with a multisystem inflammatory syndrome (MIS-C) following COVID-19.
- > Children with MIS-C presented with clinical features similar to Kawasaki disease or toxic shock syndrome, such as fever (94%), abdominal symptoms (86%), rash (37%) and conjunctivitis (26%). 60% of children presented in shock.
- > In acute COVID-19 infection in children, most common radiological findings include unilateral/bilateral subpleural opacities, consolidation with ground-glass opacities and no pleural effusions. Notably, no other systems are affected.
- > In contrast, MIS-C findings include perihilar bronchial wall/interstitial thickening, atelectasis, consolidation, pleural effusions. Children also demonstrate cardiovascular abnormalities, including cardiomegaly, pericardial effusion, pancarditis and coronary artery aneurysms. While some of these cardiac features are shared with Kawasaki disease, MIS-C may be more aggressive.
- > Gastrointestinal radiological findings include ascites, mesenteric inflammation, RIF lymphadenopathy, bowel wall thickening, splenic infarcts and gallbladder inflammation.
- > Neuroimaging abnormalities were only seen in one child who had a large hemispheric infarct, likely secondary to ECMO.
- > All children required supportive and pharmacological management, including ventilation, inotropes, IVIG, methylprednisolone and biologics. One death occurred, with all other children being discharged.
- > Limitations: sample size limits generalisation, varying amounts of imaging studies depending on disease severity may lead to over-representation of abnormal findings.

Reviewed by: Associate Professor Simone Mandelstam

# IMMUNOLOGY

Julian Loo Yong Kee - 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

**Rapid decay of anti-SARS-CoV-2 antibodies in persons with mild COVID-19**  
<https://www.nejm.org/doi/full/10.1056/NEJMc2025179?source=nejmtwitter&medium=organic-social>

- > Participants: n = 34
  - 30 of 34 participants SARS-CoV-2 positive by PCR.
  - Other four of 34 participants were not tested due to testing availability but had a high likelihood of having COVID-19.
  - Most participants had a mild illness; two require oxygen supplementation and anti-inflammatory drug.
  - Method: Blood samples were collected at day 37 and 86 post-symptoms onset were analysed by enzyme-linked immunosorbent assay to detect anti-SARS-CoV-2 spike receptor-binding domain IgG.
- > Initial mean IgG level: 3.48 log<sub>10</sub> ng per mL (2.52-4.41).
- > Estimated mean change was -0.0083 log<sub>10</sub> ng per mL per day (-0.0352 – 0.0062): Half-life ~36 days.
- > Concerns that humoral immunity against SARS-CoV-2 may not be long-lasting in persons with mild COVID-19.
- > Further studies required to quantify protection threshold and rate of decline of antiviral antibodies beyond 90 days.
- > Limitations: Protective role of antibodies against SARS-CoV-2 is unknown. Cannot extrapolate antibody patterns beyond the observed period of ~90 days.

Reviewed by: Dr Ryan Toh

# INFECTION CONTROL

Daniel Lamanna - 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

## Particle sizes of infectious aerosols: implications for infection control

[https://www.thelancet.com/journals/lanres/article/PIIS2213-2600\(20\)30323-4/fulltext](https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(20)30323-4/fulltext)

- > Viewpoints of infectious aerosols to help inform needed infection control measures to protect healthcare workers. Studies of cough aerosols from those with various respiratory infections have shown similarities in aerosol size distribution, suggesting the need for personal respiratory protective equipment for all those in close proximity to a suspected pathogen.
- > An infection control policy is based on the premise that the majority of respiratory infections are transmitted by large droplets ( $> 5 \mu\text{m}$ ) - produced by sneezing and coughing and depositing on fomites or mucosal surfaces.
  - Guidelines demonstrate that most respiratory infections are transmitted by infectious droplets (particles  $> 5 - 10 \mu\text{m}$  in size).
- > Aerosols: infectious plumes containing a suspension of pathogens inside particles hanging in the air - particle size is the most important determinant of aerosol behaviour.
  - Imaging studies demonstrate that aerosol plumes (formed by coughing and or sneezing) contain the highest concentration of particles, which dissipate in the air over time and distance; said distance is only now much further than initially recognised (up 8 m).
  - Particles  $< 5 \mu\text{m}$  can remain airborne indefinitely in most indoor environments and tend to be deposited in the lower respiratory tract.
- > Current evidence suggests that infected individuals can produce infectious aerosols with a wide range of particle sizes, with pathogens immediately respirable in the small particle ( $< 5 \mu\text{m}$ ) size range.
  - Data is now demonstrating that SARS-CoV-2 is transmitted by both large and small particle aerosols.
- > Healthcare workers should be protected from the risk of infection.
  - Surgical masks may offer respiratory protection compared to not wearing a mask.
  - Filtering face-piece respirators offer more respiratory protection than surgical masks.
  - The most effective method of protection is powered air-purifying respirators (PAPRs) hoods.

- Face shields decrease exposures to and contamination from large particle aerosols - they do not offer inhalation protection against small particle aerosols.
- Masking of patients can reduce infectious aerosol exposure.

Reviewed by: Dr Wonie Uahwatanasakul

# MENTAL HEALTH

Thomas Hill – 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

**What are the psychological research priorities for the COVID-19 pandemic and beyond?**

<https://onlinelibrary.wiley.com/doi/full/10.1111/bjop.12468>

- > Research priorities were informed by an expert panel convened by the British Psychological Society, a wider advisory panel with international input, and a survey completed by 539 psychological scientists.
- > Forty research priorities were recognised; the following eight priorities were the highest ranked in each broad area of psychology.
- > Biological: How do we address the negative biological impacts of SARS-CoV-2 on mental health?
- > Clinical: What coping mechanisms are useful in reducing mental health problems during a pandemic?
- > Cognitive: What are the impacts of COVID-19 infection, treatment, and recovery on cognition, behaviour, and the brain?
- > Developmental: How has the COVID-19 pandemic affected children's development?
- > Educational: How do school closures influence educational progress and physical and mental health outcomes for all children and young people?
- > Health: How do we address the negative psychological impact of the COVID-19 pandemic?
- > Occupational: What is the impact on remote and flexible working arrangements on employee health, mental wellbeing, teamwork, performance, organisational productivity, and colleague/client relationships?
- > Social: What makes people adhere to anti-COVID-19 measures?

Reviewed by: Professor David Coghill

# PERINATAL HEALTH

Samar Hikmat – 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

**Providing breastfeeding support during the COVID-19 pandemic: concerns of mothers who contacted the Australian Breastfeeding Association (not peer reviewed)**

<https://www.medrxiv.org/content/10.1101/2020.07.18.20152256v1.full.pdf>

- > An online survey (nine open-ended questions) explored the concerns of 340 mothers (two fathers, one grandmother) regarding breastfeeding during the COVID-19 pandemic. Concerns included:
  - Needing support to continue breastfeeding, to increase breast milk supply, or to restart breastfeeding as mothers felt that breastfeeding could protect their infant from COVID-19 and wanted to avoid/reduce formula feeding. Reasons why breastfeeding was seen as protective were: boosting the infant's immune system and concerns about the inability to access infant formula.
  - Inability to access face-to-face health services either due to fear of contracting COVID-19 or due to reduction of support services provided. Specific issues relating to this include:
    - Concerns about inadequate infant weight gain due to the inability to access health services to have their infants weighed.
    - Mothers with flu-like symptoms likely caused by mastitis were advised not to come in person to their G.P. due to possible overlap with COVID-19 symptoms or mothers themselves afraid of visiting a doctor to obtain treatment.
  - Insufficient milk supply, with some attributing this to the stress of the pandemic.
  - Safety of breastfeeding if they are infected with COVID-19.
  - Emotional wellbeing, including stress/anxiety, finding isolation difficult, and needing reassurance.
- > The findings of this survey suggest that the COVID-19 pandemic may have increased the perceived importance of breastfeeding and changed the infant feeding practices of Australian women. It further highlights the important role of the Australian Breastfeeding Association (ABA) in providing remote support/advice to mothers during the COVID-19 pandemic through Helpline and LiveChat. Finally, the study points to a lack of current emergency planning for infants in Australia and calls for this to be urgently funded and implemented.

Reviewed by: Professor Suzanne Garland

Alastair Weng – 3rd Year Medical Student,  
Department of Paediatrics, The University of Melbourne

**Neonatal management and outcomes during the COVID-19 pandemic: an observation cohort study**

[https://www.thelancet.com/journals/lanchi/article/PIIS2352-4642\(20\)30235-2/fulltext?utm\\_campaign=tlcoronavirus20&utm\\_content=135443436&utm\\_medium=social&utm\\_source=twitter&utm\\_channel=tw-27013292](https://www.thelancet.com/journals/lanchi/article/PIIS2352-4642(20)30235-2/fulltext?utm_campaign=tlcoronavirus20&utm_content=135443436&utm_medium=social&utm_source=twitter&utm_channel=tw-27013292)

- > The authors observed the rate of perinatal transmission of SARS-CoV-2 from positive mothers under strict infection control measures in New York City.
- > Little is known about COVID-19 infection in pregnancy and breastfeeding, although it was postulated that intrauterine transmission is unlikely. Case reports of infections in neonates from COVID-19-positive mothers exist.
- > Of the 1481 deliveries between 22/03 and 17/05, 120 neonates were born from 116 COVID-19-positive mothers (8% of mothers). 26% of mothers reported never being symptomatic.
- > Strict hand hygiene, breast cleansing and surgical masks were required when in contact with their baby, who was allowed to "room-in" unless clinically contraindicated. Education was given pre-discharge, but 12% did not follow these instructions at all times.
- > Neonates of COVID-19-positive mothers were tested at 12-24 hours, 5-7 days and 14 days of life, with a telehealth review at one month enquiring about symptoms. 0/120 neonates tested positive at 24 hours, along with 0/79 and 0/72 at 5-7 days and 14 days respectively (others lost to follow-up). All neonates were asymptomatic except for one with one day of fever.
- > This suggests that it is likely safe to allow the mother-infant relationship to develop with adequate hygiene measures in place. However, larger and longer studies with a lower loss to follow-up would contribute greater evidence to a consensus protocol.

Reviewed by: Professor Suzanne Garland

# THERAPEUTICS

Professor Fiona Russell - Director of Child and Adolescent Health  
PhD program, Department of Paediatrics, The University of  
Melbourne: Group Leader, Asia-Pacific Health Research, MCRI

**Hydroxychloroquine with or without Azithromycin in Mild-to-Moderate COVID-19**  
<https://www.nejm.org/doi/full/10.1056/NEJMoa2019014?source=nejmtwitter&medium=organic-social>

- > Multicentre, randomised, open-label, three-group, controlled trial involving hospitalised patients with suspected or confirmed COVID-19 who were receiving either no supplemental oxygen or a maximum of four litres per minute of supplemental oxygen were included.
- > Patients were randomly assigned to receive standard care, standard care plus hydroxychloroquine at a dose of 400 mg twice daily, or standard care plus hydroxychloroquine at a dose of 400 mg twice daily plus azithromycin at a dose of 500 mg once daily for seven days.
- > The primary outcome was clinical status at 15 days in the modified intention-to-treat population (patients with a confirmed diagnosis of COVID-19).
- > 667 patients underwent randomisation; 504 patients had confirmed COVID-19 and were included in the modified intention-to-treat analysis.
- > As compared with standard care, the proportional odds of having a higher score on the seven-point ordinal scale at 15 days was not affected by either hydroxychloroquine alone (odds ratio, 1.21; 95% confidence interval [CI], 0.69 to 2.11; P=1.00) or hydroxychloroquine plus azithromycin (odds ratio, 0.99; 95% CI, 0.57 to 1.73; P=1.00).
- > Prolongation of the corrected Q.T. interval and elevation of liver-enzyme levels were more frequent in patients receiving hydroxychloroquine, alone or with azithromycin than in those who were not receiving either agent.
- > Among patients hospitalised with mild-to-moderate COVID-19, the use of hydroxychloroquine, alone or with azithromycin, did not improve clinical status at 15 days as compared with standard care.

# TRANSMISSION

Grace Newman – 3<sup>rd</sup> Year Medical Student,  
Department of Paediatrics, The University of Melbourne

## **SARS-CoV-2 viral load in the upper respiratory tract of children and adults with early acute COVID-19 (not peer reviewed)**

<https://www.medrxiv.org/content/10.1101/2020.07.17.20155333v1>

- > Most infected children exhibit limited disease severity or are asymptomatic, and the role of children in spreading the virus is not well understood.
- > Method: Prospective cohort study at a single centre.
  - All participants had positive nasopharyngeal swab, no previous positive SARS-CoV-2 test, were symptomatic and  $\leq 5$  days since onset of symptoms.
  - Specimens were either tested using an in-house method based on the Charité E gene assay or the Cobas 6800 SARS-CoV-2 RT-PCR (Roche, Switzerland), targeting the E and the ORF1 gene.
- > 352 patients  $\geq 16$  years of age and 53 patients  $< 16$  years of age.
  - Mean average viral loads (log<sub>10</sub> RNA copies/mL): children (0-11 years) – 6.13 +/- 2.02 (range 3.06-9.21), adolescents (12-19) – 5.85 +/- 2.32 (range 2.36-9.42), young adults (20-45) – 5.91 +/- 1.88 (range 2.37-9.39), and adults (>45) – 6.33 +/- 2.05 (range 2.49-9.39).
  - The postulated threshold for infectious virus shedding – 6 log<sub>10</sub> RNA copies/mL – was reached in 49.5 – 62.9% patients.
- > Viral load similar across all age ranges in the first five days of symptoms.
- > Presumed lower transmission from children not due to lower viral load.
- > Limitations: Limited sample size of children, meaning age group comparisons may have lacked power. Only including symptomatic patients. Inclusion of patients tested by two different methods.

Reviewed by: Dr Celeste Donato

Evelyn Andrews - 4th Year Medical Student,  
Department of Paediatrics, The University of Melbourne

**Exposure assessment for airborne transmission of SARS-CoV-2 via breathing, speaking, coughing and sneezing (not peer reviewed)**

<https://www.medrxiv.org/content/10.1101/2020.07.02.20144832v1.full.pdf>

- > Whether or not SARS-CoV-2 exhibits airborne transmission has been contested in the literature. This study aimed to assess the risk of airborne transmission in the indoor environment and to assess transmission risk based on the activity of the infected person in the room.
- > An exposure assessment model was created, which estimated the risk of SARS-CoV-2 particle inhalation by one or multiple persons after an infected patient was in an enclosed environment.
- > Scenarios differed based on the activity of the infected person (breathing for 20 minutes, speaking for 20 minutes, coughing once, sneezing once), the viral load of the infected person, the size of the room, the number of exposed persons, and the exposure time of the uninfected person/s.
- > The calculated concentrations of airborne particles ranged from 10<sup>-4</sup> to 10<sup>2</sup> per litre of air. This is consistent with previously observed airborne concentrations in hospital rooms of infected patients.
- > In general, there was a low probability of transmission (<1%) when the viral concentration in secretions was low (below 10<sup>5</sup> per mL). This was true, regardless of the activity of the infected person. The probability of transmission was steadily increased if the viral concentration was higher.
- > Sneezing leads to the highest probability of exposure, followed by coughing, then speaking, and lastly breathing.
- > The exposure probability is increased by 4-10 times if any parameter changed (e.g., with more exposed persons, a longer time for exposure, or smaller room, activity of the infected person).
- > Limitations: The model assumes that aerosol droplets have the same viral concentration as oropharyngeal/nasopharyngeal swabs, that the viral particles in mucus are evenly distributed, that the expelled droplets are instantaneously and evenly distributed throughout the room, and that all viral particles remained activated and infectious in the air. The model involves the infected person leaving the room before the uninfected person/s enter. This is unlikely to reflect the reality of COVID-19 transmission.
- > Conclusions: Aerosol transmission of SARS-CoV-2 is possible. A single sneeze or cough is associated with higher airborne transmission risk compared with breathing or speaking for 20 minutes. This finding reinforces the importance of staying home when experiencing even mild respiratory symptoms. Future studies may be improved by recreating a more dynamic transmission model.

Reviewed by: Dr Lien Anh Ha Do

# OTHER RESOURCES

Burnet Institute research findings, policy and technical reports  
[https://www.burnet.edu.au/covid-19//36\\_know\\_c19\\_hub](https://www.burnet.edu.au/covid-19//36_know_c19_hub)

National COVID-19 clinical evidence taskforce: continually updated evidence-based clinical guidelines  
<https://covid19evidence.net.au/>

Lancet COVID-19 papers  
[https://www.thelancet.com/coronavirus?utm\\_campaign=tlcoronavirus20&utm\\_content=126383502&utm\\_medium=social&utm\\_source=twitter&hss\\_channel=tw-27013292](https://www.thelancet.com/coronavirus?utm_campaign=tlcoronavirus20&utm_content=126383502&utm_medium=social&utm_source=twitter&hss_channel=tw-27013292)

Focuses on paediatric clinical, epidemiological, transmission and neonatal aspects  
<https://dontforgetthebubbles.com/evidence-summary-paediatric-covid-19-literature/>

All COVID-19 literature  
<https://www.ncbi.nlm.nih.gov/research/coronavirus/>

Oxford COVID-19 Evidence Service  
<https://www.cebm.net/oxford-covid-19/>

Daily updates on COVID-19 literature compiled by Canadian medical students  
[https://docs.google.com/forms/u/0/d/e/1FAIpQLSfOxCoAuLV0aJdf\\_z2uWV7r3FaPzAO86q9ZXBcTZ1OcCE\\_Nw/formResponse](https://docs.google.com/forms/u/0/d/e/1FAIpQLSfOxCoAuLV0aJdf_z2uWV7r3FaPzAO86q9ZXBcTZ1OcCE_Nw/formResponse)

Victorian Department of Health and Human Services  
<https://www.dhhs.vic.gov.au/coronavirus-covid-19-daily-update>

Australian Government  
<https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-current-situation-and-case-numbers>  
<https://www.health.gov.au/resources/publications/management-and-operational-plan-for-people-with-disability>

COVID-19 and the kidney, which is currently the recommended U.S. resource  
<http://www.nephjc.com/covid19>

University of Birmingham COVID-19 Research Briefing  
<https://www.birmingham.ac.uk/university/colleges/mds/Coronavirus/COVID-19-research-briefing.aspx>

Australian Government Department of Health Webinars on the COVID-19 response for primary care practitioners  
<https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-advice-for-the-health-and-aged-care-sector/webinars-on-the-coronavirus-covid-19-response-for-primary-care-practitioners>

Global summary, identifying changes in the reproduction number, rate of spread, and doubling time during the COVID-19 outbreak whilst accounting for potential biases due to delays in case reporting both nationally and sub-nationally  
<https://epiforecasts.io/covid/posts/global/>

WHO Rolling updates on COVID-19  
<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>

Scimex.org – breaking science news portal: COVID-19 stories (research and expert commentary)  
<https://www.scimex.org/info/2019-20-coronavirus>  
<https://www.covid19-hpc-consortium.org/>

Introduction to Coronavirus: free, online course aimed at teenagers and young adults: scientists and experts from the London School of Hygiene & Tropical Medicine explain research to understand the virus and guide the global response to Coronavirus  
<https://www.open.edu/openlearncreate/course/view.php?id=5319>

# EDITORIAL TEAM

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