PASS THE TURKEY, HOLD THE VIRUSES: MORE ON HOUSEHOLD TRANSMISSION OF SARS-COV-2

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NORTHWEST PORTLAND AREA INDIAN HEALTH BOARD
GAME PLAN FOR TODAY

• Review a recent article on household transmission from a large study in Singapore (a place where Covid-19 has been successfully held in check)

• Touch on newsworthy findings in other scientific reports (MMWR and others)
OBJECTIVES

- Summarize the key behavioral/environmental features important to household transmission from one study with very thorough case and contact investigations
TAKE HOME MESSAGES

- Several well-investigated case-clusters of household transmission from multiple settings now reported with widely disparate findings
- Behavioral/environmental factors most strongly associated with household transmission in Singapore were sharing a bedroom, engaging >30 minutes of conversation with index case/s
- Overall attack proportion was low (6%) among household contacts monitored very closely, possibly related to quick removal of index case from home environment to a Singapore hospital
- CDC has more fully embraced aerosol spread as a cause of transmission in special circumstances—not just in medical procedures—tho not the major infection route
- Reports show evidence of virions (infectious particles) in the air for long periods of time, in lab setting—as well as identification of SARS-Cov-2 RNA in air samples from other environmental studies
BACKGROUND

- Thanksgiving on the horizon, with many US households still planning large events…according to recent survey by Ohio State University (40% of sample are planning on attendance at dinners with 10 or more people; one-third of respondents will NOT ask guests to wear masks)

- Portland International Airport and regional projections for highway travel suggest a big travel holiday, tho not as big as past years (same story nationwide).

- Brigg reviewed household transmission potential modelling article in a recent session: very high success for transmission with closed room (no ventilation), no masks, speaking >30 minutes…even with appropriate distancing (he also covered recent MMWR article on household transmission)

- Eileen has just reviewed Hopi household transmission study, showing a high proportion of household contacts who tested positive (or got sick) after contact with two index cases
BACKGROUND, CNTD

- Small gatherings are considered to be very important in current Covid-19 spike nationwide
- CDC has discussion of aerosol transmission on their website (low but possible risk in some crowded, non-ventilated settings)
- Political leaders (like Oregon Governor among others) strongly advise against gatherings of >6 people in updated mandates
- Most studies on household transmission have been small...the Singapore report is much more robust and worth our time/energy to digest key findings
STUDY DESIGN, NG ET AL, LANCET 2020

- Retrospective cohort (according to authors, but is more like a survey), with all confirmed cases from Jan 23 to Apr 3 in Singapore (pop 5.8 million)
- Approx. 100% of household contacts were identified and quarantined for 14 days
- All cases quickly removed from homes and hospitalized until 3 negative tests (even for mild illness)
- All household contacts monitored and reported symptoms 3 times per day
- Contacts underwent PCR testing and/or serologic testing
- Lengthy WHO-derived questionnaire
- Univariate and multivariate analyses for risk factors for infections among household contacts
RESULTS

• 1114 index cases identified by PCR tests

• 1779 household contacts (high proportion were spouses of index cases)

• 6% of household contacts were positive (up to 15% if data are viewed with different parameters in the analysis)

• Main risk factors associated with infection/illness in contacts were sharing bedroom with index case, >30 minute conversation with index case
NEXT DATA TABLES SHOW…

- (Authors approach for this part of the study: presenting the findings as a survey instead of a retrospective cohort, infected household members on far left column)

- The univariate analysis results on the left, multivariable analysis results on right side, with p values displayed after OR’s and 95% confidence intervals.

- Note that the OR’s can change substantially with control for multiple confounders, using regression techniques
<table>
<thead>
<tr>
<th>Sharing of meals</th>
<th>Count (Percentage)</th>
<th>Count (Percentage)</th>
<th>Odds Ratio (95% CI)</th>
<th>p-Value</th>
<th>Count (Percentage)</th>
<th>Count (Percentage)</th>
<th>Odds Ratio (95% CI)</th>
<th>p-Value</th>
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</thead>
<tbody>
<tr>
<td>Did not share a meal with any COVID-19 case</td>
<td>17 (19.1%)</td>
<td>228 (46.1%)</td>
<td>Ref</td>
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<tr>
<td>Shared a meal without involving any of the following: eating from the same plate, drinking from the same cup, or eating with the same utensils</td>
<td>26 (29.2%)</td>
<td>141 (28.5%)</td>
<td>2.47 (1.30–4.72)</td>
<td>0.0060</td>
<td>1.03 (0.48–2.21)</td>
<td>0.93</td>
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<tr>
<td>Shared a meal involving one or more of the following: eating from the same plate, drinking from the same cup, or eating with the same utensils</td>
<td>46 (51.7%)</td>
<td>126 (25.5%)</td>
<td>4.90 (2.69–8.90)</td>
<td>&lt;0.0001</td>
<td>1.29 (0.60–2.80)</td>
<td>0.52</td>
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<td>Duration of COVID-19 Contact</td>
<td>Individuals</td>
<td>Ref</td>
<td>p-value</td>
<td>Ref</td>
<td>p-value</td>
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<td>Individual not spoken to</td>
<td>21 (23.6%)</td>
<td>331 (66.9%)</td>
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<td>COVID-19 case spoke for &lt;30 min</td>
<td>32 (36.0%)</td>
<td>124 (25.1%)</td>
<td>4.07 (2.26-7.32)</td>
<td>&lt;0.0001</td>
<td>3.91 (2.09-7.34)</td>
<td>&lt;0.0001</td>
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<td>COVID-19 case spoke for ≥30 min</td>
<td>36 (40.5%)</td>
<td>40 (8.1%)</td>
<td>14.19 (7.55-26.64)</td>
<td>&lt;0.0001</td>
<td>7.86 (3.86-16.02)</td>
<td>&lt;0.0001</td>
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<td>Sharing of bedroom and toilet</td>
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<td>Did not share a bedroom with any COVID-19 case and did not use the same toilet as any COVID-19 case</td>
<td>19 (21.4%)</td>
<td>296 (59.8%)</td>
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<tr>
<td>Used the same toilet as a COVID-19 case but did not share a bedroom</td>
<td>12 (13.5%)</td>
<td>105 (21.2%)</td>
<td>1.78 (0.84–3.79)</td>
<td>0.14</td>
<td>1.11 (0.49–2.54)</td>
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<td>Shared a bedroom with a COVID-19 case but did not use the same toilet</td>
<td>13 (14.6%)</td>
<td>28 (5.7%)</td>
<td>7.23 (3.23–16.18)</td>
<td>&lt;0.0001</td>
<td>5.38 (1.82–15.84)</td>
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<td>Shared a bedroom and used the same toilet as a COVID-19 case</td>
<td>45 (50.6%)</td>
<td>66 (13.3%)</td>
<td>10.62 (5.84–19.33)</td>
<td>&lt;0.0001</td>
<td>5.05 (1.85–13.79)</td>
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UNUSUAL FEATURES OF SINGAPORE STUDY

• Mandated government compliance with public health measures (but not with study participation)
• Mandatory admission of all sick Covid-19 cases, even with mild illness—no discharge until three negative tests
• Mandatory quarantine of all home contacts with 3 times a day symptom monitoring
• Apparently lots of money to do this kind of large and thorough study!
POTENTIAL LIMITATIONS OF STUDY

• Retrospective cohort? Not really. Key data were presented mostly as a survey
• Limited days of home exposure to index case (both a strength and a limitation)
• No information of co-morbid conditions of contacts at home
• Limited information on mask wearing at home, or for distancing
• ? Was the >30 minute conversation cumulative, and over a consistent time period for all contacts? unclear
Household Transmission of Severe Acute Respiratory Syndrome Coronavirus 2 from Adults to Children

Chee Fu Yung, MBChB1,2,3, Kai-qian Kam, MBBS1,2,4, Chia Yin Chong, MBBS1,2,3,4, Karen Donceras Nadua, MD1,2,4, Jiahui Li, MBBS1,2,4, Natalie Woon Hui Tan, MBBS1,2,3,4, Sashikumar Ganapathy, MBBS1,2,3,4,5, Khai Pin Lee, MBBS1,2,3,4,5, Kee Chong Ng, MBBS6, Yoke Hwee Chan, MBBS6, and Koh Cheng Thoon, MBBS1,2,3,4

Knowledge of transmission dynamics of severe acute respiratory syndrome coronavirus 2 from adults to children in household settings is limited. We found an attack rate among 213 children in 137 households to be 6.1% in households with confirmed adult 2019 novel coronavirus disease index case(s). Transmission from adult to child occurred in only 5.2% of households. Young children <5 years old were at lowest risk of infection (1.3%). Children were most likely to be infected if the household index case was the mother. (J Pediatr 2020;225:249-51).
THE NEXT SLIDE IS THE ‘TAKE HOME MESSAGE’ IN MMWR FROM THE NASHVILLE AND MARSHFIELD HOUSEHOLD TRANSMISSION STUDY, NOV 6, 2020; REVIEWED BY BRIGG EARLIER IN OUR SERIES
Among all household members, 102 had nasal swabs or saliva specimens in which SARS-CoV-2 was detected by RT-PCR during the first 7 days of follow-up, for a secondary infection rate of 53% (95% CI = 46%–60%) (Table 2). Secondary infection rates based only on nasal swab specimens yielded similar results (47%, 95% CI = 40%–54%). Excluding 54 household members who had SARS-CoV-2 detected in specimens taken at enrollment, the secondary infection rate was 35% (95% CI = 28%–43%).

Forty percent (41 of 102) of infected household members reported symptoms at the time SARS-CoV-2 was first detected by RT-PCR. During 7 days of follow-up, 67% (68 of 102) of infected household members reported symptoms, which began a median of 4 days (IQR = 3–5) after the index patient’s illness onset. The rates of symptomatic and asymptomatic laboratory-confirmed SARS-CoV-2 infection among household members was 36% (95% CI = 29%–43%) and 18% (95% CI = 13%–24%), respectively.
A SERIES OF REMINDERS FOR YOUR PATIENTS AND FOR YOU, RE: TRANSMISSION AT GATHERINGS

• You have seen the next slides in earlier talks on SARS-CoV-2

• CDC website and some supportive observations/studies suggest aerosol transmission may occur in special circumstances, but far less important than droplet spread
Droplets containing virus: large ⬤ small ⬤
MOROWSKA REF: THE WORLD SHOULD FACE THE REALITY OF AEROSOL SPREAD…

• SARS-CoV-1 spread in air, evidence ‘well supported’
• On cruise ships, many infections occurred after lockdown/confinement to rooms, implicating ventilation systems
• Growing body of lab evidence suggests importance of aerosol spread
• Current limitations on actually measuring virus in the air in ‘typical rooms’, given flow dynamics, dilution, etc
• Lab based study under controlled conditions
• Viruses were shot via nebulizer into a closed chamber
• Viruses recovered at different time periods, up to 16 hours, with retained morphology (and presumed infectiousness as with the original samples) as seen on EM
• virus has ‘aerosol fitness’
SCIENTISTS’ LETTER TO WHO, THE ‘FIXES’ RELATED TO ENVIRONMENTAL CONTROL OF AEROSOLS:

- Increased ventilation
- Exhaust control so air in buildings does not pose a risk when exhaust is in use
- Avoid overcrowding

- Brigg and others have made these points earlier
THINKING OUT OF THE BOX…RELATED TO REDUCTION OF TRANSMISSION RISK AT THANKSGIVING DINNER

• [https://www.who.int/news-room/q-a-detail/q-a-how-is-covid-19-transmitted](https://www.who.int/news-room/q-a-detail/q-a-how-is-covid-19-transmitted) includes,
  “There have been reported outbreaks of COVID-19 in some closed settings… where people may be shouting, [talking](https://www.who.int/news-room/q-a-detail/q-a-how-is-covid-19-transmitted), or singing.” WHO

• One possible response to dampen this transmission method, particularly around the dinner table…just avoid talking, instead use…
SOCIAL GATHERING ADVICE

• Don’t do it (not realistic, apparently, according to Ohio State survey)
• Pay strict attention to currently recommended containment strategies that address main transmission modes for SARS-CoV-2…including ventilation
• Don’t over-react to aerosol transmission possibilities…but recognize potential still there in certain settings
• Talking produces droplets! (Not just coughing or sneezing)
REFERENCES

- MMWR article link November 6
  [link to MMWR article]

- arhttps://www.cdc.gov/mmwr/volumes/69/wr/mm6944e1.htm?s_cid=mm6944e1_w&utm_source=Global+Health+NOW+Main+List&utm_campaign=295490ff45-EMAIL_CAMPAIGN_2020_10_30_04_25&utm_medium=email&utm_term=0_8d0d062dbd-295490ff45-3033369


- Grazie a Grazia