Epidemiology of COVID-19, Global and India Update
Cluster of Pneumonia Cases of Unknown Origin in December 2019
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Cluster of Pneumonia Cases of Unknown Origin in December 2019

- Of 41 patients, 66% (27) had exposure to a seafood market (Lancet, DOI 10298)

- SARS originated in Guangdong, China in November 2002
- Affected 8096 persons, 774 deaths in 26 countries
Timeline

12 Dec 2019
Wuhan reported first case

31 Dec 2019
Chinese authorities alerted WHO about cases of Pneumonia of unknown etiology

1 Jan 2020
Wuhan Seafood Market closed

3 Jan
India notified by WHO

7 Jan
2019-nCoV Identified

12 Jan
Wuhan’s First Death
Timeline

13 Jan
Thailand confirms first case outside China

30 Jan
India confirms first case
WHO declared PHEIC

11 Feb
Virus renamed SARS-CoV-2 and disease COVID-19

28 Feb
WHO
Regional, global risk
VERY HIGH

3 Mar
Cases (74 countries) Local transmission (31 countries)
## WHO Risk Assessment

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>China</td>
<td>Very High</td>
</tr>
<tr>
<td>Regional</td>
<td>Very High</td>
</tr>
<tr>
<td>Global</td>
<td>Very High</td>
</tr>
</tbody>
</table>

- **Likelihood of spread**
  - Ongoing human-to-human transmission
  - Confirmed identified in 31 provincial level administrative areas (10 with >100 cases)
  - Majority of cases exported outside China have been epidemiologically linked to Wuhan
  - Human-to-human transmission documented in other countries
  - Source of outbreak remains unknown
  - Disaggregated data is needed to better understand the epidemiology

- **Potential impact to human health**
  - Can causes severe disease and fatalities
  - Severity is not fully understood
  - Transmission from asymptomatic cases

- **Likelihood of insufficient control capacities**
  - China has implemented major control measures
  - Currently affected countries have strong public health systems
  - Some countries may be less prepared to manage cases
Coronavirus

• Large family of enveloped, positive-strand RNA viruses
• Ecologically diverse, circulates in humans and animals
• Divided into 4 genera: alpha, beta, delta, and gamma
  • alpha and beta CoVs infect humans
• Four HCoVs (HCoV 229E, NL63, OC43, and HKU1) endemic globally
  • 10-30% of upper respiratory tract infections in adults
• Rarely, animal coronaviruses evolve and infect people and then spread between people—SARS (2002) and MERS (2012)
Phylogenetic analysis of the 2019-nCoV and other *Beta coronavirus* genomes under the Orthocoronavirinae subfamily

- Phylogeny – Closest genetic similarity was found in a coronavirus that had been isolated from bats
  - CoVZC45 (MG772933.1) and
  - BM48-31/BGR/2008(GU190215.1) branches

3/7/2020

Source: WHO
Coronavirus – Transmissibility

- Infected droplets
  - >5 μm, travel <1 m
- Aerosols
  - <5 μm, travel >1 m
- Contact
  - Hands, surfaces

Figure 1. Transmission routes: droplet, airborne, direct contact, and indirect contact. (Indirect contact: routes involving a combination of hand and surface.) Definitions of ‘droplet’ and ‘droplet nuclei’ are from Atkinson et al. 5
Coronavirus – Transmissibility

Survivability outside body:
- 1-2 days on nonporous surfaces
- 8-12 hours on porous surfaces
- Currently this information on 2019-nCoV not clear

Incubation period:
Current estimates of the incubation period of SARS-CoV-2 range from 2-14 days.

* Transmission routes involving a combination of hand & surface = indirect contact.

Figure 1. Transmission routes: droplet, airborne, direct contact, and indirect contact. (Indirect contact: routes involving a combination of hand and surface.) Definitions of 'droplet' and 'droplet nuclei' are from Atkinson et al. 5
## Cases and Deaths–China

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Deaths</th>
<th>CFR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hubei</td>
<td>67,332</td>
<td>2,871</td>
<td>4.2</td>
</tr>
<tr>
<td>Outside Hubei</td>
<td>13,090</td>
<td>113</td>
<td>0.8</td>
</tr>
<tr>
<td>China</td>
<td>80,422</td>
<td>2,984</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Source: WHO  
As on 04 March, 2020
Comparison of Cases and Deaths in China–Hubei and other Provinces

Cases

Deaths

Source: WHO
As on 04 March, 2020
## Distribution of Cases – Outside China

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Countries reporting*</td>
<td>77</td>
</tr>
<tr>
<td>Cases</td>
<td>12,668</td>
</tr>
<tr>
<td>Deaths</td>
<td>214</td>
</tr>
<tr>
<td>CFR %</td>
<td>1.7</td>
</tr>
<tr>
<td>Local Transmission %</td>
<td>42</td>
</tr>
</tbody>
</table>

* Includes one international conveyance

Source: WHO  
As on 04 March, 2020
Age Distribution of Cases in China, Surveillance Data (n=72,314)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9</td>
<td>0.9%</td>
</tr>
<tr>
<td>10-29</td>
<td>9.3%</td>
</tr>
<tr>
<td>30-39</td>
<td>17.0%</td>
</tr>
<tr>
<td>40-49</td>
<td>19.2%</td>
</tr>
<tr>
<td>50-59</td>
<td>22.4%</td>
</tr>
<tr>
<td>&gt;60</td>
<td>31.2%</td>
</tr>
</tbody>
</table>

- Median age: 51 years
- Interquartile range=39-63 years
- Range= 2 days-100 years
- Males: 51%
- Health care workers: 3.8%
  - 88% reported from Hubei
Signs and Symptoms of Cases in China

Report of WHO China Joint Mission, Feb 2020

- FEVER: 87.9%
- COUGH: 67.7%
- FATIGUE: 38.1%
- SPUTUM: 33.4%
- SHORTNESS OF BREATH: 18.6%
- MAYALGIA: 14.8%
- SORE THROAT: 13.9%
- HEADACHE: 13.6%
- CHILLS: 11.0%
- VOMITING: 5.0%
- DIARROHEA: 3.7%
Epidemiology—Presentation of Illness (n=72,314)

- Critical: 4.7%
- Severe: 14%
- Mild: 81%
Epidemiology–Severity of Illness (n=72,314)

Case Fatality Rate (%)

- >=80
- 70-79
- 60-69
- 50-59
- 40-49
- 30-39
- 20-29
- 10-19
- 0-9

China CDC Weekly Vol2 (8)
Epidemiology–Severity of Illness (n=72,314)

- **Cormorbidity**: 74%
- **No Cormorbidity**: 26%
Pattern of Disease Progression

Report of WHO China Joint Mission, Feb 2020
Comparison of Severity and Transmissibility of Human Infection with Coronavirus and Influenza virus

<table>
<thead>
<tr>
<th>Virus</th>
<th>Transmissability ($R_0$)</th>
<th>Severity (CFR %)</th>
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<tbody>
<tr>
<td><strong>COVID-19</strong> i</td>
<td>2.00</td>
<td>3.00</td>
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<tr>
<td>SARS</td>
<td>3.00</td>
<td>9.00</td>
</tr>
<tr>
<td>MERS</td>
<td>1.05</td>
<td>36.00</td>
</tr>
<tr>
<td>IFL-S ii</td>
<td>1.27</td>
<td>NA</td>
</tr>
<tr>
<td>IFL-P</td>
<td>1.45</td>
<td>0.02</td>
</tr>
<tr>
<td>HCoVs iii</td>
<td>1.00</td>
<td>NA</td>
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Source: Communicable Disease Manual
Comparison of Severity and Transmissibility of Human Infection with Coronavirus and Influenza virus

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Source: Communicable Disease Manual
Risk of Disease Transmission in COVID-19 Patients following Onset of Illness (n=18)

(NEJM, DOI 10.1056)
Risk of Disease Transmission in COVID-19 Patients following Onset of Illness (n=18)

- High viral load detected soon after symptom onset up to day 21 of illness onset
- More in nose than throat
- Viral shedding similar to Influenza as opposed to SARS

(NEJM, DOI 10.1056)
Asymptomatic Stage in COVID-19

• China Surveillance record of 72,314 cases shows 1.2% asymptomatic cases

• Diamond Princess ship with 3712 crew and staff reported 2.9% asymptomatic cases
Role of Asymptomatic COVID-19 Cases in Disease Transmission

Findings from two case reports indicate possibility of transmission in asymptomatic stage

A familial cluster of 5 patients in Anyang, China, had contact before their symptom onset with one asymptomatic family member who had traveled from the epidemic center of Wuhan. Asymptomatic patient turned PCR positive 20 days after contact with index case (JAMA, Feb 21, 2020)

Two family cluster of 18 cases in Guangdong were examined for viral load in specimens, one asymptomatic contact turned PCR positive 7 days after contact (NEJM, DOI10,1056)

Possible viral shedding and role of asymptomatic cases in driving transmission by in community
COVID-19 Epidemic Curve and Major Interventions implemented in China

- A novel coronavirus was isolated by China CDC
- Emergency monitoring, case investigation, close contact management and market investigation initiated, technical protocols for Wuhan released
- NHC notified WHO and relevant countries and regions
- Gene sequencing completed by China CDC
- Outbreak announced by WHC, NHC and China CDC involved in investigation and response
- Huanan seafood wholesale market closed
- China CDC publicly shared the gene sequence of the novel coronavirus
- NHC issued diagnosis and control technical protocols
- NCIP incorporated as a notifiable disease in the Infectious Disease Law and Health and Quarantine Law in China
- NHC started officially daily disease information release
- State council initiated joint multisectoral mechanism
- Wuhan implemented strict traffic restrictions
- WHO announced PHEIC
- Two new hospitals were established in Wuhan
- Enhanced admission and isolated treatment of cases in Hubei
- Resumption of labor and rehabilitation
- Strategy and response adjustment

- First Stage (before Jan. 19, 2020)
- Second Stage (Jan. 20-Feb. 7, 2020)
- Third Stage (after Feb. 8, 2020)
COVID-19 Epidemic Curve outside China

Source: WHO Sitrep
COVID-19 Epidemic Curve, India (n=29)
COVID-19 Epidemic Curve, India (n=29)

• Median age: 37 years
• Range: 20-77 years
• Males: 59%
• Proportion with history of travel: 83%
Conclusions

• COVID-19 respiratory pathogen, easily transmissible from person to person
• Elderly and co-morbid are high risk
• Cases rising outside China, including India, with limited local transmission
• Containment for elimination possible
  • Case management
  • Contact tracing
  • Health system strengthening (isolation wards, medical supplies)
  • Public risk communication
Thank you