Pandemic, waves and variants

Shahid Jameel, PhD
Ashoka, India
Oxford, UK
DEFINITIONS

**ENDEMIC** is something that belongs to a particular people or country; e.g., malaria in some parts of Africa.

**OUTBREAK** is a greater-than-anticipated increase in the number of endemic cases; e.g., bird flu in domestic fowl and humans.

**EPIDEMIC** is a disease that affects a large number of people within a community, population, or region; e.g., Ebola 2014-15 in West Africa.

**PANDEMIC** is an epidemic that spreads to multiple countries on different continents; e.g., Spanish Flu 1918, Covid-19.
A pandemic is an epidemic that travels
P in pandemic = passport

COVID-19 in Wuhan, China was an Epidemic
COVID-19 after March 2020 became a Pandemic
Flattening the curve, raising the line

Without mitigation

Static healthcare capacity
Effect of inadequate mitigation

Active cases

Time

Initial surge and mitigation
State Elections
27 March – 29 April
Kumbh Mela
1 – 30 April
Nationwide Lockdown
B.1.617
B.1.617.2 (Delta)
Weddings etc
2nd wave

- Complacency – individuals, government and policy mechanisms
- Super spreader events – State elections, Kumbh mela, weddings, etc
- More infectious variants (Alpha and Delta)
- Insufficient vaccine coverage – about 4.2 million doses by February end (0.3% one dose)
Rate of change
Covid-19, estimated transmissibility* of variants compared with original SARS-CoV-2 virus

<table>
<thead>
<tr>
<th>Variant</th>
<th>Scientific name</th>
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<tbody>
<tr>
<td>Delta† (India)</td>
<td>B.1.617.2</td>
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<tr>
<td>Gamma (Brazil)</td>
<td>P.1</td>
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<tr>
<td>Alpha (Britain)</td>
<td>B.1.1.7</td>
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<tr>
<td>Beta (South Africa)</td>
<td>B.1.351</td>
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<tr>
<td>Epsilon (United States)</td>
<td>B.1.427-9</td>
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<tr>
<td>SARS-CoV-2</td>
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Sources: Davies et al. (2021); Pearson et al. (2021); Faria et al. (2021); Allen et al. (2021); Centers for Disease Control and Prevention; Public Health England

*Odds ratio of infection or relative R number
†Extrapolated from transmissibility relative to alpha variant

The Economist
Genetic epidemiology of SARS-CoV-2
Spike mutations in variants of concern

Delta (1,212,336 seqs)
Alpha (1,087,950)
Beta (35,636)
Gamma (87,042)
SARS-CoV2 and its Spike protein

A HIDDEN SPIKE
The spike protein of SARS-CoV-2 is coated in sugar molecules, or glycans, which disguise it from the immune system. It can hinge at three points on the stalk, giving it flexibility.
INDIA
33.56 mn cases
446,080 deaths
3rd wave?

- Population exposure?
- Individual behaviour – will people follow preventive measures?
- Vaccine coverage? ~833 million doses by 22 September (~60% adults with one dose)
- More infectious variants?
Summary

- Pandemics are the worldwide spread of infectious diseases.
- COVID-19 in India has been a mix of challenges, lost opportunities, denial, policy-based evidence making. The positives include healthcare workers, vaccine industry and researchers.
- Virus variants showed progressively improved transmission that led to fresh waves. But vaccines are holding up in mitigating severe disease.
- High levels of exposure during the devastating 2\textsuperscript{nd} wave and increasing vaccination rates make a big 3\textsuperscript{rd} wave improbable.