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COVID-19 Transmission Dynamics: A Little Bit of Confusion

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Mumtaz GR et al have very well figured out the schematic representation of the natural history of COVID-19 from exposure until recovery or death.¹ As per evidence COVID-19 virus (SARS-COV-2) is mainly transmitted between person to person through respiratory droplet and contact routes.² Droplets are exhaled when person breathes, speaks, laughs, coughs, or sneezes³ But all disease transmission routes are possible for COVID-19 such as droplet, contact, aerosol and airborne.⁴

Droplet transmission occurs when a person is in close contact with person having respiratory symptoms such as coughing or sneezing and is therefore at risk of having his/her mucosae of mouth and nose or conjunctiva exposed to possibly infective respiratory droplets.^{2,5} The droplets usually fall within a few meters, the likelihood of transmission COVID-19 is decreased if people remain at least 2 meters apart.⁵

Transmission of virus can occur by direct contact with infected person and indirect contact with surfaces in the immediate environment or with objects used by the infected person.²

Airborne transmission refers to the presence of microbes within droplet nuclei, which can remain in the air for long periods of time and be transmitted to others over distances greater than one meter.²

There is possibility of SARS-COV-2 airborne transmission due to its persistence into aerosol droplets in a viable and infectious form. Brosseau LM, Setti L et al. and Morawsk L and Cao J. strongly support this.^{4,6,7}

Certain activities like singing and procedures or support treatments generate aerosols such as endotracheal intubation, bronchoscopy, open suctioning, administration of nebulized treatment, manual ventilation before intubation, turning the patient to the prone position, disconnecting the patient from the ventilator, non-invasive positive-pressure ventilation, tracheostomy, and cardiopulmonary resuscitation.^{2,4,5}

The oro-fecal route of transmission is also well-documented in patients affected by COVID-19.⁸ All secretions except sweat and excretions, including

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diarrheal stools from patients with known or possible COVID-19, must be considered as potentially infectious.⁹ There are reports of vertical transmission¹⁰ and there is potential of transmission from human eyes.¹¹

World Health Organization (WHO) in its 46-situation report released on March 6, 2020 on the basis of available data suggested that 80% of infections are mild or asymptomatic, 15% are severe infection, requiring oxygen and 5% are critical infections, requiring ventilation.¹² World Health Organization (WHO) recognizes three stages of COVID-19 transmission symptomatic, pre-symptomatic and asymptomatic. Symptomatic transmission refers to transmission from a person while they are experiencing symptoms. Pre-symptomatic transmission means person spreads the disease prior to symptoms appear and eventually develops symptoms. Asymptomatic transmission refers to transmission from a person who does not develop any symptoms.¹³

Heneghan C et al assessed the proportion of asymptomatic cases and reported between 5-80% of people testing positive for COVID-19 may be asymptomatic quoting 22 studies done between January and March 2020. Some of the asymptomatic cases will become symptomatic over next week, then they may be called as pre-symptomatic.¹⁴ It is not easy to resolve the difference between people who are pre-symptomatic and will later on develop symptoms of COVID-19 and how many among asymptomatic remain asymptomatic. There are limitations to capture accurate data because of limited testing capacity and method of testing and shortened time frame as evidence continues to unfold.¹⁵

Dr. Maria Van Kerkhove of World Health Organization said on June 8, 2020 asymptomatic can occur but it is very rare and Coronavirus patients without symptoms aren't driving the spread of the virus. Government responses should focus on detecting and isolating infected people with symptoms. The earlier statement of WHO was "Preliminary evidence from the earliest outbreaks indicated the virus could spread even if people didn't have symptoms"^{14,16} WHO expert backtracked from the statement on June 9, 2020, but Dr Maria Van Kerkhove maintained that real-world data suggested it could still be a rare event.¹⁷

A study published on June 3, 2020 in the Annals of Internal Medicine mentions about the possibility of

asymptomatic people becoming likely silent super-spreaders of SARS-CoV-2. The likelihood that approximately 40-45% of those infected with SARS-CoV-2 will remain asymptomatic suggests that the virus might have greater potential than previously estimated to spread silently and deeply through human populations"¹⁸

Ferretti L et al. proposed four categories of transmission symptomatic, pre-symptomatic, asymptomatic and environmental transmission and developed the infectiousness model. According to them symptomatic transmission means direct transmission from a symptomatic individual, through a contact that can be readily recalled by the recipient. Pre-symptomatic transmission refers to direct transmission from an individual that occurs before the source individual experiences noticeable symptoms. Asymptomatic transmission implies direct transmission from individuals who never experience noticeable symptoms. Environmental transmission denotes transmission via contamination, and specifically in a way that would not typically be attributable to contact with the source in a contact survey. Their infectiousness model suggests that the total contribution to R_0 [R_0 (R-naught) new infections estimated from single case (R = reproduction number of an infectious disease)] from pre-symptomatic is 0.9 (CI, 0.2 to 1.1) out of total point estimate 2.0 (pre-symptomatic 0.9, symptomatic 0.8, environmental 0.2 and asymptomatic 0.1) and the pre-symptomatic transmission, almost enough to sustain an epidemic on its own.¹⁹

There is wide variation in proportion of asymptomatic cases reported from different parts of the World. What could be the reasons? Shall population-based studies resolve this issue? But what proportion of asymptomatic may turn to symptomatic and fall into category of pre-symptomatic? Will this issue also be resolved? If there is rare for asymptomatic person to transmit the disease, it likely means asymptomatic cases are not major threat to public then why public is advised and urged to wear the mask? There is little bit confusion because of limitations in capturing actual data and understanding of the limitations of mathematical infectiousness models too. The scientific and public health community continue to learn about novel SARS-CoV-2 (COVID-19) transmission dynamics and succeed in containing this dull and fearing pandemic.

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