Ibitoye Esther Olamide

15/MHS06/030

MLS 406 Open Test

QUESTION

Discuss the etiology, origin, structure and pathophysiology of COVID-19.

ANSWER

Coronavirus is zoonotic which means they are normally transmitted between human and animals. The Coronavirus disease (COVID-19) is an infectious disease caused by a new strain of coronavirus which is severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that has not been previously identified in humans. It was first reported to WHO (World Health Organization) on the 31st of December 2019 in Wuhan, China. Other names for coronavirus are Novel coronavirus pneumonia, Wuhan pneumonia and Wuhan coronavirus.

ETIOLOGY

The WHO and CDC state that its primarily spread during close contact and by small droplets produced when people cough or sneeze; with close contact being within 1 to 2 meters (3 to 6 feet). Respiratory droplets may be produced during breathing but the virus isn’t generally airborne. The droplets can land in the mouths or noses of people who are nearby or can possibly be inhaled into the lungs. Some medical procedures such as intubation and cardiopulmonary resuscitation (CPR) may cause respiratory secretions to be aerosolized and thereby result in airborne spread. It may also spread when one touches a contaminated surface and then touches their eyes, nose or mouth. It’s most contagious when people are symptomatic, although spread may be possible before symptoms appear. The European Centre for Disease Prevention and Control (ECDC) states that while it’s not entirely clear so easily is because the disease can spread from one person and infect two or three others. The virus can survive on surfaces for up to 72hours. Time from exposure to onset of symptoms is generally between 2 to 14 days with an average of 5 days.

ORIGIN

The recent outbreak began in Wuhan, a city in the Hubei province of China. Reports of the first COVID-19 cases started in December 2019. Coronavirus are common in certain species of animals such as cattle and camels. Although the transmission of coronaviruses from animals to humans are rare, this new strain likely came from bats, though one study suggests pangolins may be the origin. However, it remains unclear exactly how the virus first spread to humans. Some reports trace the earliest cases back to a seafood and animal market in Wuhan. It may have been from there that SARS-CoV-2 started to spread to humans.

STRUCTURE

Coronaviruses are large pleomorphic spherical particles with bulbous surface projections. The diameter of the virus particles is around 120nm. The envelope of the virus in electron micrograph which appears as a distinct pair of electron dense shells.

The viral envelope consist of a lipid bilayer where the membrane (M), envelope (E) and spike (S) structural proteins are anchored. A subset of coronaviruses also have a shorter spike-like surface protein called HEMAGGLUTININ ESTERASE (HE).

Inside the envelope, there is the nucleocapsid, which is formed from multiple copies of nucleocapsid (N) protein, which are bound to the positive-sense single-stranded RNA genome in a continuous beads-on-a-string type conformation. The lipid bilayer envelope, membrane proteins, and nucleocapsid protect the virus when it is outside the host cell.

PATHOPHYSIOLOGY

The lungs are the organs most affected by COVID-19 because the virus assesses host cells via the enzyme ACE2, which is most abundant in the type II alveolar cells of the lungs. The virus uses a special surface glycoprotein called a ‘spike’ (peplomer) to connect to ACE2 and enter the host cell. The density of ACE2 in each tissue correlates with the severity of the disease in that tissue and some have suggested that decreasing ACE2 activity might be protective, though another view is that increasing ACE2 using angiotensin II receptor blocker medications could be protective and that these hypotheses need to be tested. As the alveolar disease progresses, respiratory failure might develop and death may follow. The virus also affects gastrointestinal organs as ACE2 is abundantly expressed in the glandular cells of gastric, duodenal and rectal epithelium as well as epithelial cells and enterocytes of the small intestine.

SIGNS AND SYMPTOMS.

|  |  |
| --- | --- |
| SYMPTOMS | PERCENTAGE (%) |
| Fever | 87.9 |
| Dry cough | 67.7 |
| Fatigue | 38.1 |
| Sputum production | 33.4 |
| Loss of smell | 15 to 30 |
| Shortness of breath | 18.6 |
| Muscle or joint pain | 14.8 |
| Sore throat | 13.9 |
| Headache | 13.6 |
| Chills | 11.4 |
| Nausea or vomiting | 5.0 |
| Nasal congestion | 4.8 |
| Diarrhea | 3.7 to 31 |
| Hemoptysis | 0.9 |
| Conjunctival congestion | 0.8 |

Emergency symptoms include difficulty breathing, persistent chest pain or pressure, confusion, difficulty waking, and bluish face or lips; immediate medical attention is advised if these symptoms are present. Less commonly, upper respiratory symptoms such as sneezing, runny nose or sore throat may be seen.

DIAGNOSIS

The WHO has published several testing protocols for the disease. The standard method of testing is real-time reverse transcription polymerase chain reaction (rRT –PCR). The test is typically done on respiratory samples obtained by a nasopharyngeal swab, however a nasal swab or sputum sample may also be used. Results are generally available within few hours to two days.

STATISTICS

The total statistics of coronavirus (COVID-19) worldwide as at 1st of April 2020, 20:09 GMT (Greenwich Mean Time Zone) are as follows:

Total Cases- 926,621

Total Deaths- 46,438

Total Recovered- 193,431

Active Cases- 686,752

Critical- 34,935

Total Cases/1M pop- 118.9

Deaths/1M pop- 6.0

RISK FACTORS

It includes;

* Recent travel from or residence in an area with ongoing community spread of COVID-19 as determined by CDC or WHO.
* Close contact with someone who has COVID-19 such as when a family member or health care worker takes care of an infected person.

PRECAUTIONS

* Avoid large events and mass gatherings.
* Avoid close contact (about 6 feet) with anyone who is sick or has symptoms.
* Cover your mouth and nose with your elbow or a tissue when you cough or sneeze and discard the tissue immediately.
* Wash your hands often with soap and water for at least 20 seconds or use an alcohol-based hand sanitizer that contains at least 60% alcohol.
* Avoid touching your eyes, nose and mouth if yours hands aren’t clean.
* Clean and disinfect surfaces you often touch on a daily basis.
* Stay at home away from work, school or public areas if you’re sick, unless you’re going to get medical care.
* Avoid taking public transportation if you’re sick.

REFERENCES

["WHO Director-General's opening remarks at the media briefing on COVID-19"](https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020). [*World Health Organization*](https://en.wikipedia.org/wiki/World_Health_Organization) *(WHO)* (Press release). 11 March 2020. [Archived](https://web.archive.org/web/20200311212521/https:/www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020) from the original on 11 March 2020. Retrieved 12 March 2020.

Symptoms of Novel Coronavirus. *www.cdc.gov*. 10 February 2020. [Archived](https://web.archive.org/web/20200130202038/https:/www.cdc.gov/coronavirus/2019-ncov/about/symptoms.html) from the original on 30 January 2020. Retrieved 11 February 2020.

Lucey D, Sparrow A (14 January 2020). ["China Deserves Some Credit for Its Handling of the Wuhan Pneumonia"](https://foreignpolicy.com/2020/01/14/china-response-wuhan-pneumonia-better-sars/). [*Foreign Policy*](https://en.wikipedia.org/wiki/Foreign_Policy). [Archived](https://web.archive.org/web/20200115042408/https:/foreignpolicy.com/2020/01/14/china-response-wuhan-pneumonia-better-sars/) from the original on 15 January 2020. Retrieved 13 March 2020

Wiles, Siouxsie (14 March 2020). ["After 'Flatten the Curve', we must now 'Stop the Spread'. Here's what that means"](https://thespinoff.co.nz/society/14-03-2020/after-flatten-the-curve-we-must-now-stop-the-spread-heres-what-that-means/). *The Spinoff*. [Archived](https://web.archive.org/web/20200326232315/https:/thespinoff.co.nz/society/14-03-2020/after-flatten-the-curve-we-must-now-stop-the-spread-heres-what-that-means/) from the original on 26 March 2020. Retrieved 13 March 2020.

Anderson RM, Heesterbeek H, Klinkenberg D, Hollingsworth TD (March 2020). "How will country-based mitigation measures influence the course of the COVID-19 epidemic?". *Lancet*. **395** (10228): 931–934. [doi](https://en.wikipedia.org/wiki/Digital_object_identifier):[10.1016/S0140-6736(20)30567-5](https://doi.org/10.1016%2FS0140-6736%2820%2930567-5). [PMID](https://en.wikipedia.org/wiki/PubMed_Identifier) [32164834](https://pubmed.ncbi.nlm.nih.gov/32164834)