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Review Article

An Update on COVID-19: Clinico-pathology & Epidemiological Perspective

Ahad MA[1], Kamal SM[2], Islam MN[3]

Abstract

Novel Corona virus is a highly infectious and contagious virus producing pandemic throughout the world with high morbidity and mortality. It causes primarily respiratory tract infection and also affects gastrointestinal system, nervous system, endocrine system and others. RT-PCR is the gold standard test. Management is primarily symptomatic. Most people recover spontaneously and few patients requiring oxygen and ventilation. For prevention of transmission of viruses vaccination and some healthy practice should be maintained like frequent washing of hands with soap and water for at least 20 seconds or using an alcohol-based hand sanitizer that contains at least 70% alcohol, avoiding touching face, nose, or mouth with unwashed hands, use of face mask, avoiding close contact with people who are sick. This article highlights an update of clinico-pathology and epidemiological aspects including its clinical manifestations and preventive measures in deed.

Keywords: Novel corona virus, Gastro corona virus, Pandemic, Contagious, COVID-19

Introduction

Corona viruses are a group of viruses that cause diseases in mammals and birds. In humans, the viruses cause respiratory infections which are typically mild, including the common cold; however, rarer forms such as SARS, MERS and the novel Corona virus causing the current outbreak can be lethal. In cows and pigs they may cause diarrhea, while in chickens they can cause an upper respiratory disease.[1]

Corona viruses are viruses in the subfamily Orthocoronavirinae in the family Coronaviridae, in the order Nidovirales. Corona viruses are enveloped viruses with a positive-sense single stranded RNA genome and with a nucleocapsid of helical symmetry. The genomic size of coronaviruses ranges from approximately 26 to 32 kilobases, the largest for an RNA virus. The name "Coronavirus" is derived from the Latin corona, meaning crown or halo, which refers to the characteristic appearance of the virus particles (virions): by electron microscopy, which have a fringe of large, bulbous surface projections creating an image reminiscent of a royal crown or of the solar corona[2].This morphology is created by the viral spike (S) peplomers, which are proteins that populate the surface of the virus and determine host tropism.

1. Professor Dr. Md. Abdul Ahad
Professor, Department of Gastroenterology &
Principal, Khulna Medical College.
2. Professor Dr. S M Kamal
Professor, Department of Medicine
Khulna City Medical College, Khulna.
3. Dr. Md Nazrul Islam
Assistant Professor, Department of Medicine
Khulna Medical College.

Correspondence to:
Professor Dr. Md. Abdul Ahad
Professor, Department of Gastroenterology &
Principal, Khulna Medical College..
Email: drahadbd@yahoo.com

Human Corona viruses

Corona viruses are believed to cause a significant percentage of all common colds in human adults and children. Corona viruses cause colds with major symptoms, e.g. fever, throat pain, swollen adenoids, primarily in the winter and early spring seasons. Corona viruses can cause pneumonia-either direct viral pneumonia or a secondary bacterial pneumonia. They can also cause bronchitis-either direct viral bronchitis or a secondary bacterial bronchitis. Corona viruses are a large family of viruses that are known to cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).

Novel Corona virus (NCOV-19)

In December 2019, a pneumonia outbreak was reported in Wuhan, China. On 31 December 2019, the outbreak was traced to a novel strain of corona virus, which was labeled as 2019-NCOV by the World Health Organization (WHO). Later it has been labeled as SARS COV-2 and diseases it caused has been labeled as COVID-19. According to Daniel Lucey at Georgetown University, the first human infections must have occurred in November 2019 or earlier. The Wuhan strain has been identified as a new strain of Beta corona virus from group 2B with an ~70% genetic similarity to the SARS-COV. The virus was suspected to have originated in snakes, but many leading researchers disagree with this conclusion. Daniel Lucey, an infectious disease specialist at Georgetown University, stated that "Now it seems clear that the seafood market is not the only origin of the virus.

Gastro Corona virus

Some people with the corona virus have reported gastrointestinal symptoms including diarrhea, nausea and

vomiting[3].Estimates of how common these symptoms vary widely, from 1% to more than half of patients. For some people, the symptoms may be caused by prescribed antibiotics that can cause diarrhea as a side effect. In fact, recent medical evidence from China and the United States also suggests there is a subset of gastrointestinal corona virus patients who don't display the classic respiratory symptoms of the disease.For both elderly patients and children gastrointestinal symptoms include acute diarrhea, abdominal spasms, stomachaches, nausea vomiting, and the loss of appetite and sense of smell.

Seven Strains of human Corona viruses

1) Human corona virus 229E (HCoV-229E) 2)Human corona virus OC43 (HCoV-OC43) 3)SARS-CoV4)Human corona virus NL63 (HCoV-NL63, New Haven corona virus) 5)Human corona virus HKU1 6)Middle East respiratory syndrome corona virus (MERS-CoV), previously known as novel corona virus 2012 and HCoV-EMC7) Novel corona virus (2019-nCoV/SARS COV-2), also known as Wuhan pneumonia or Wuhan corona virus. ('Novel' in this case means newly discovered, or newly originated, and is a placeholder name. The corona viruses HCoV-229E, -NL63, -OC43, and -HKU1 continually circulate in the human population and cause respiratory infections in adults and children world-wide.[4]

Variants of SARS COV-2

Till now there are four dominant variants of SARS-CoV-2 (variants of concern) spreading among global populations: 1) Alpha Variant (formerly called the UK Variant and officially referred to as B.1.1.7), first found in London and Kent, 2) Beta Variant (formerly called the South Africa Variant and officially referred to as B.1.351), 3) Gamma Variant (formerly called the Brazil Variant and officially referred to as P.1), and 4) Delta Variant (formerly called the India Variant and officially referred to as B.1.617.2).

Transmissions &risk factors

The main way the disease spreads is through respiratory droplets expelled during coughing. When someone coughs or sneezes they spray small liquid droplets from their nose or mouth which may contain virus. It enters through nose, mouth and eyes into another person. The risk of catching COVID-19 from asymptomatic cases is not uncommon.

Corona viruses are zoonotic, meaning they are transmitted between animals and people. It is not certain, how long the virus that causes COVID-19 survives on surfaces, but it seems to behave like other corona viruses. Studies suggest that corona viruses (including preliminary information on the COVID-19 virus) may persist on surfaces for a few hours or up to several days. Cold weather and snow cannot kill the new corona virus. From the evidence so far, the COVID-19 virus can be transmitted in all areas, including areas with hot and humid weather.

Analysis of specimens taken from the gastrointestinal tract of 95 COVID-19 patients has identified the virus in the esophagus, stomach, duodenum and rectum. The virus also showed up in about half of the stool samples collected. The suggestion is that the gastrointestinal symptoms are caused by the virus invading the ACE2-containing cells that are found throughout the bowel. This together with the presence of the virus in the stool suggest the gastrointestinal tract as another possible route of infection and transmission.[5,6] People of all ages can be infected by the new corona virus (2019-NCoV). Older people and people with pre-existing medical conditions (such as asthma, diabetes, heart disease, and cancer) appear to be more vulnerable to becoming severely ill with the virus.

Smokers are likely to be more vulnerable to COVID-19 as the act of smoking means that fingers (and possibly contaminated cigarettes) are in contact with lips which increases the possibility of transmission of virus from hand to mouth. Smokers may also already have lung disease or reduced lung capacity which would greatly increase risk of serious illness. Smoking products such as water pipes often involve the sharing of mouth pieces and hoses, which could facilitate the transmission of COVID-19 in communal and social settings.

Clinical manifestations

The incubation period is 2-14 days. The most common symptoms of COVID-19 are fever, tiredness, dry cough and breathing difficulties. Some patients may have headache, fatigue, aches and pains, nasal congestion, runny nose, sore throat or diarrhea with or without blood. Other features are burning sensation in whole body, chills and rigor, cold body, new onset of severe anorexia and anosmia. Hepatic manifestations- may include acute hepatitis and abnormal liver biochemical tests. These symptoms are usually mild and begin gradually. In more severe cases infection can cause pneumonia, severe acute respiratory syndrome, and even death. Some cases are asymptomatic.

Gastro intestinal manifestations are not uncommon in patients with COVID-19 infection and with passage of time they are more frequently being reported. In fact, a subgroup of these cases might present with pure GI symptoms. Fecal shedding of the virus and its detection not only establishes the GIT involvement by the virus but also highlights a potential source of spread i.e. feco-oral transmission. GI symptoms are commonly encountered in hospitalized COVID-19 patients. GI symptoms were not associated with poorer outcomes such as increased mortality and increased mechanical intubation in COVID-19 patients.

Illness severity

The largest cohort reported of >44,000 persons with COVID-19 from China showed that illness severity can range from mild to critical. Mild to moderate (mild symptoms up to mild pneumonia) -81%; Severe (dyspnea, hypoxia, or >50% lung involvement on imaging) -14%; Critical (respiratory failure, shock, or multi-organ system dysfunction)- 5%.

Post covid syndrome/Long covid syndrome

Long COVID, also known as post-COVID-19 syndrome, post-acute sequelae of COVID-19 (PASC), or chronic COVID syndrome (CCS) is a condition characterized by long-term sequelae appearing or persisting after the typical convalescence period of COVID-19.Symptoms reported by people with long COVID include: Extreme fatigue, Long lasting cough, Muscle weakness, Low grade fever, Inability to concentrate (brain fog), Memory lapses, Changes in mood, sometimes accompanied by depression and other mental health problems, Sleep difficulties, Headaches, Joint pain, Needle pains in arms and legs, Diarrhea and bouts of vomiting, Loss of taste and smell, Sore throat and difficulties swallowing, New onset of diabetes and hypertension, Heartburn (gastro esophageal reflux disease), Skin rash, Shortness of breath, Chest pains, Palpitations, acute kidney injury, and chronic kidney disease, Anosmia, Parosmia ,Tinnitus, deep vein thrombosis and pulmonary embolism etc.

Laboratory investigations

Viral testing

Diagnosis of COVID-19 requires detection of SARS-CoV-2 RNA by reverse transcription polymerase chain reaction (RT-PCR). Detection of SARS-CoV-2 viral RNA is better in nasopharynx samples compared to throat samples. Lower respiratory samples may have better yield than upper respiratory samples. SARS-CoV-2 RNA has also been detected in stool and blood[7]. Viral RNA shedding may persist over longer periods among older persons and those who had severe illness requiring hospitalization (median range of viral shedding among hospitalized patients 12-20 days.

Antigen testing and antibody testing are also used with variable sensitivity and specificity

Blood tests

Lymphopenia is the most common laboratory finding in COVID-19, and is found in as many as 83% of hospitalized patients.[8,9,10] Lymphopenia, neutrophilia, elevated SGPT & SGOT levels, elevated LDH, high CRP, and high ferritin levels may be associated with greater illness severity. Elevated D-dimer and lymphopenia have been associated with high mortality. Procalcitonin is typically normal on admission, but may increase among those admitted to an ICU.[11]

Radiographic findings

Chest radiographs of patients with COVID-19 typically demonstrate bilateral patchy opacities. High resolution CT scan of Chest has better sensitivity which demonstrates bilateral, basal, peripheral ground glass opacities. But this chest CT imaging pattern is non-specific and overlaps with other infections.One study found that 56% of patients who presented within two days of diagnosis had a normal CT[12].Conversely, other studies have identified chest CT abnormalities in patients prior to the detection of SARS-CoV-2 RNA.

Treatment

Treatment is mainly symptomatic. Most people will recover spontaneously. Modalities of treatment are:

1) Antivirals: oral Favipiravir, Injectable Remdesivir
2) Steroids: Methylprednisolone or Dexamethasone
3) Anticoagulants: Enoxaparin, Rivaroxaban
4) Oxygen & Ventilation. Getting plenty of nutritious diet, drinking fluids and taking rest. No antibiotics do work against viruses but in some cases may be prescribed to prevent secondary bacterial infection.

Prevention

There is a good number of vaccines now available worldwide to prevent human corona virus infections. Healthy measures must be practiced to reduce risk of getting or spreading an infection by- frequent washing of hands with soap and water for at least 20 seconds, an alcohol-based hand sanitizer that contains at least 70% alcohol, avoiding touching face, nose, or mouth with unwashed hands, use of face mask. Avoiding mask gatherings &close contact with people who are sick is needed. Cleaning and disinfecting surfaces that are frequently touched should be adopted. Staying home in isolation when sick is also necessary.

Vaccines

There are four main types of vaccine available now:

1) Killed virus vaccine (eg. Sinovac, Sinopharm, Bharat biotech);
2) Viral vector vaccine (e.g. Oxford-Astrazeneca vaccine, Johnson & Jonhson vaccine, Sputnik V);
3) Nucleic Acid (m RNA) vaccine (e.g. Pfizer/BioNTech, Moderna Vaccine.);
4) Protein Sub unit vaccine (e.g. Novavax, Sanofi/GSK.)

Conclusions

SARS COV-2 is a highly infectious virus with a high mortality. About 5 million documented deaths have been occurred till now. But no definite antiviral treatment is available till now. New research and trials are ongoing worldwide. Thus new information's are coming daily. Along with mass vaccination we should adopt healthy practice like avoiding close contact with people suffering from acute respiratory infections, frequent hand-washing, especially after direct contact with ill people or their environment, wearing mask etc.

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We do pray for those COVID-19 patients who sacrificed their lives during this pandemic and grateful to the respected COVID-19 fighters (doctors and health workers) those who dedicated their lives in this war against invisible enemy and pray for their departed souls.

Conflict of interest: No

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