COMMENTARY

SARS-COV2 OUTBREAK: EMERGENCE, TRANSMISSION AND CLINICAL FEATURES OF HUMAN CORONAVIRUSES

Muhammad Imran, Rehana Yasmeen*

College of Physicians & Surgeons Pakistan, *The Indus Hospital, Karachi-Pakistan

The novel coronavirus was emerged from China Wuhan city and spread around the globe within a few days. COVID-19 is rapidly transmitted from one human to another, and it is also a highly pathogenic infection. Genetic analysis confirmed that SARS-CoV 2 is phenotypically related to SARS-CoV; therefore, the possible reservoir for SARS-CoV 2 could be bats. According to WHO more than 20 million individuals infected with SARS-CoV 2 while more than 700,000 peoples lost their lives due to COVID-19 as of 13th August 2020. Up-till now, there is no anti-viral therapy or vaccines available for the treatment and prevention of COVID-19. Although dexamethasone and tocilizumab help in reducing mortality among critical patient infected with COVID-19 However, China, Brazil and USA have developed vaccines which is currently under trial phase. Still, up-till now, there is no clinically approved treatment regimen available against COVID-19.

Keywords: Human Coronavirus; SARS-CoV 2; Transmission of COVID-19; Treatment of coronavirus; Vaccine

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INTRODUCTION

Recently in late December 2019, there is an outbreak of pneumonia, which was originated from Wuhan city of China.[1] Initially, this pneumonia outbreak was rapidly spread from Wuhan city to other cities of China.[2] On 30th January 2020 outbreak of COVID-19 was declared as an International concern of public health emergency by WHO. Up-till now SARS-CoV 2 affected more than 190 countries of the world. On 11 March 2020, WHO declares COVID-19 as a pandemic.[3] In the past the outbreak of SARS-COV in 2003 affected 26 countries of the world, more than 8000 individuals were infected with a 9% mortality rate, on the contrarily COVID-19 spreads in more than 190 countries of the world and infected more than 20 million individual and more than 700,000 peoples died due to this deadly virus till 13th August 2020.[4,5] The trend of the number of new cases and deaths reported due to COVID-19 by WHO shown in figure 1 and 2.[6]

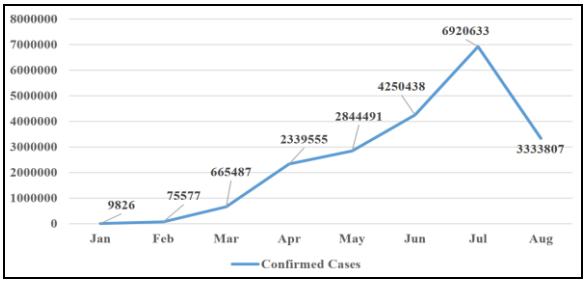

Figure-1: Trend of confirmed cases of COVID-19 reported around the world from Jan 2020 to 13th August 2020

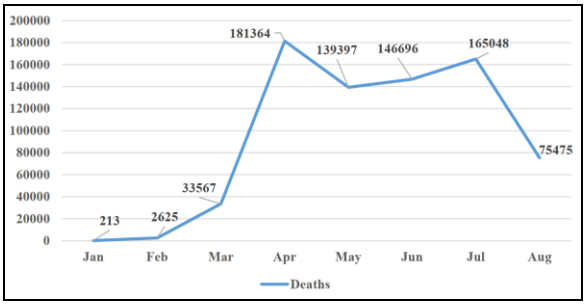

Figure-2: Deaths due to COVID-19 around the world from Jan 2020 to 13th August 2020

The typical clinical features of SARS-CoV 2 infection includes myalgia, fever, and cough with unusual finding in CT chest while the less common clinical signs include productive cough, haemoptysis, diarrhoea, and headache.[7–9] The clinical features of COVID-19 are slightly different from SARS-CoV that occur in 2002-2003, indicating that new emergent viral pneumonia can transmit from person to person.[10] In this review, we briefly discuss clinical features, transmission, and the outbreak of different coronavirus. We also discuss treatment options and the development of vaccines of COVID-19.

Clinical Features and Outbreaks of different Coronavirus:

In 2003 the majority of peoples in Guangdong province of China were found to be infected with an unknown pathogen causing a disease known as SARS. The pathogen was later identified as a sub-group of β-coronavirus, and it was labelled as SARS-CoV. The clinical features of SARS-CoV were similar to clinical features of pneumonia with an interstitial lung injury,

which causes ARDS in infected patients. SARS was started from China Guangdong province and rapidly spread outside China. SARS-CoV infected more than 8000 individuals, and more than 700 peoples lost their lives all around the globe due to this coronavirus.[11,12] In 2012 another specie of coronavirus diagnosed in Saudi Arabian nationals. This virus was identified as a sub-group of coronavirus, and it was named as (MERS-CoV). According to WHO, MERS-CoV infected more than 2400 peoples, and almost 838 lost their life due to this coronavirus.[13] MERS-CoV belongs to a beta coronavirus subgroup, and it is phenotypically different from other human CoV. The MERS-CoV infection causes mild respiratory diseases, while the progression of infection may lead to severe respiratory problems. Patients with positive MERS-CoV suffered from pneumonia along with ARDS and kidney failure.[14] In late December 2019, health authorities of Hubei province reported to WHO regarding several patients of pneumonia with unknown cause in Wuhan city. Initially, the spread of disease was started from the Wuhan city sea food market and rapidly infected more than 50 peoples.[15] On 12th January 2020, health authorities of China reported that infected peoples have suffered from viral pneumonia.[02] Further analysis of isolated specimens of an infected person through sequence-based analysis confirmed pathogen as a novel coronavirus. Initially, it was suggested by the researchers that infected patients have associated with the exposure of sea food markets where live animals were sold. However, further investigation revealed that novel coronavirus could transmit from one human being to another. This transmission of novel coronavirus occurs due to the exposure of respiratory droplets of an infected person. The respiratory droplets enter into the human body via inhalation through mouth or nose.[16,17]

Transmission and origin of Different Coronavirus:

It is crucial to determine the transmission and source of origination of pathogens in order to design effective preventive strategies to control the outbreak of pathogens. During the outbreak of SARS-CoV, initially, researchers suggested that palmcivet and raccoon dogs act as a primary host of SARS-CoV. But later, it was suggested that civet palm might be act as a secondary reservoir because isolated samples from civets palm reveal positive results of RNA detection.[18] In 2012 new species of coronavirus found in Saudi Arabian nationals, which was known as MERS.[14] The source of MERS-CoV was zoonotic originate from camels.[19] Recently it was revealed that bats as a primary host of MERS-CoV because MERS-CoV was detected in Perimyotis and Pipistrellus bats.[20]

The significance of infectious disease transmission through asymptomatic carriers has been already established in previous outbreaks of viral respiratory infections before COVID-19 pandemic. During outbreak of MERS-CoV, almost 12% patients were found asymptomatic who had serology test positive for MERS-CoV. Moreover 7.5% healthcare workers and 13% in general population were found asymptomatic and had tested positive for SARS-CoV during outbreak in Singapore in 2003.[21] It was assumed by some of the researchers that salivary glands may be a reservoir for SARS-CoV 2 in asymptomatic individuals. It is evident from data that SARS-CoV 2 can be highly contagious among asymptomatic individuals.[22] Previous studies suggested that there is no difference in viral load of SARS-CoV2 among symptomatic and asymptomatic patients. A symptomatic mother with positive SARS-CoV 2 nasal swab had high viral load with similar viral load as her asymptomatic 6-month baby. Mother nasal swab was become negative on 18 day of illness while baby SARS-CoV 2 nasal swab become negative on 17th day of illness.[23] Studies done in different countries shows SARS-CoV 2 virus can be transmitted through asymptomatic individual. It is alarming and of great public health concern as asymptomatic individuals increasing obviously in population.[24,25] In different parts of the world where universal screening for SARS-CoV 2 virus has been done shows that prevalence of SARS-CoV 2 positive results among asymptomatic individuals was >50%.[26]

In population-based studies antibody testing for SARS-CoV 2 was done in order to estimate the prevalence of infection among asymptomatic individuals.[27] However it is evident from different researches that antibody testing for SARS-CoV 2 among asymptomatic individuals is not a reliable method of screening due to temporal lag between formation of antibodies and viral exposure which can increase false negative diagnosis due to low titers.[28]

Treatment Strategies and Vaccine:

Initially, various treatment strategies, including anti-viral therapy, α-interferon nebulization, and broad-spectrum-antibiotics, were used in order to decrease the viral load anti-viral drugs. However, the only remdesivir had given positive results and seems to be effective against virus.[29,30] In Shanghai, healthcare specialists injected the plasma of clinically recovered COVID-19 patients to newly infected patients, which shows rapid recovery from the infection.[31] Although dexamethasone and tocilizumab seems effective in treatment of severe pneumonia among critically ill patient with COVID-19 but there is no effect of these drug on viral load. Studies suggested that dexamethasone and tocilizumab reduce mortality among critically ill COVID-19 patients.[32–35]

Currently, no vaccine available against SARS-CoV2. However, few vaccines against SARS-CoV 2 is

under process. Vaccine development for COVID-19 is on fast track, researchers estimated that development of vaccine may require 12–18 months. Currently China, Brazil and USA has developed vaccines which is currently under trial phase. China started phase 3 trial on 15000 individuals in United Arab Emirates. Moreover, Russia also developed vaccine against SARS-CoV 2 named Sputnik-V was approved by Ministry of Health of Russian Federation on 11th August 2020. This vaccine was developed by Gamaleya Research Institute of Moscow. Currently the efficacy and safety of vaccine is questionable as this vaccine is not entered into phase 3 clinical trial. Chinese Researcher are trying to develop a vaccine against SARS-COV-2 through an inactivated virus. Various other clinical trials are under process in different countries as shown in table-1.[36–38] Moreover, the healthcare specialist and researchers all over the globe are trying to determine the clinical features, pathogenicity, and choice of treatment for COVID-19, however, it is also important to determine the cross-resistance of novel coronavirus with other vaccines, this will also help in making effective treatment strategies for COVID-19.

Table-1: Summary of COVID-19 Vaccines

Vaccine Name	Trial Phase	Country
Inactivated Vaccine	Phase 3	China
CoronaVac	Phase 3	Brazil
mRNA-1273	Phase 3	USA
Bacillus Calmette-Guerin (BCG) live-attenuated vaccine	Phase 2/3	Australia, Netherland and Boston
AZD1222	Phase 2/3	United Kingdom
BNT162	Phase 2/3	Europe and North America
Ad5-nCoV	Phase 3	China
Adjuvant recombinant vaccine	Phase 2	China
ZyCoV-D	Phase 2	India
Covaxin	Phase 2	India
BBIBP-CorV	Phase 2	China
GX-19	Phase 1/2	Korea
Sputnik V	Phase 1/2	Russia
Self-amplifying RNA vaccine	Phase 1/2	United Kingdom
LUNAR-COV19	Phase 1/2	Singapore
INO-4800	Phase 1/2	USA
mRNA-based vaccine	Phase 1	Germany and Belgium
SCB-2019	Phase 1	Australia
COVAX-19	Phase 1	Australia
NVX-CoV2373	Phase 1	USA
Plant-based adjutant COVID-19 vaccine candidate	Phase 1	Canada
Molecular clamp vaccine	Phase 1	Australia
bacTRL-Spike	Pre-Clinical	Canada
PittCoVacc	Pre-Clinical	USA
V591	Pre-Clinical	USA and France
Ii-Key peptide COVID-19 vaccine	Pre-Clinical	USA
Recombinant vaccine	Pre-Clinical	USA
LineaDNA	Pre-Clinical	Italy
Ad26.COV2-S	Pre-Clinical	Canada
AdCOVID	Pre-Clinical	United Kingdom
T-COVIDTM	Pre-Clinical	USA
Protein subunit vaccine	Pre-Clinical	Canada
V590	Phase 1	USA
Adenovirus-based vaccine	Pre-Clinical	USA
AAVCOVID	Pre-Clinical	USA
Recombinant vaccine	Pre-Clinical	France and USA
HaloVax	Pre-Clinical	USA
mRNA-based vaccine	Pre-Clinical	Thailand
HDT-301	Pre-Clinical	USA

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Address for Correspondence:

Muhammad Imran, Research Analyst, College of Physicians & Surgeons Pakistan (CPSP) Karachi-Pakistan
Cell: +92 334 307 2807
Email: Imran.shekhani@hotmail.com