

COMPARISON OF SARS-COV2 WITH THE OTHER ZOOONOTIC INFECTIONS

Krishna Kumar singh ^{1*}, Anshika ², Pooja Sharma³, Priyanka goyal ⁴

¹Department of Pharmacology, School of Medical and Allied Sciences, K.R. Mangalam university, gurgaon, Haryana, India

²Department of Pharmacology, Kharvel Subharti College of Pharmacy, Swami Vivekanand Subharti University, Meerut, UP, India

³Faculty of Pharmaceutics, School of Pharmacy, Neelkanth College of Pharmacy, Meerut, UP, India

⁴Faculty of Pharmaceutics, School of Pharmacy, Neelkanth College of Pharmacy, Meerut, UP, India

Corresponding author: - Krishna Kumar Singh

School of Medical and Allied Sciences, K.R. Mangalam University, Sohna Road, Gurgaon, Haryana 122103

E-mail: ps7294746@gmail.com, Mob: 91 81264 64595, 9149122050

ABSTRACT

COVID 19 is a virus which originated from the city of Wuhan, China. This virus is similar to the earlier SARS-COV and MERS. The present day scenario is considered as the third pandemic in this century as issued by the WHO. Till now COVID-19 has infected more than 50 lac people across the globe and more than 2.5 lac people died due to it. [4] However, despite the seemingly unpredictable nature of disease emergence, there are lessons to be learned from the origins of recently emerged diseases as well as those that have their origins in the more distant past, lessons that may offer clues as to how future infectious disease outbreaks and pandemics may be prevented. The challenge lies in using the accumulated, albeit incomplete, knowledge gained from emergent diseases of our past to identify practical solutions and strategies aimed at detecting and halting future threats. Here, we review the field's current understanding of the origins of infectious diseases and the factors that contribute to their emergence. We are also highlighting the importance of the zoonotic transmission of pathogenic agents from animals to humans, the favoured mechanism by which emergent diseases have come to afflict humans throughout history comparison of related epidemics/pandemics in the past and the economic implications faced by the world. [1, 2, 3] Despite the fact that most emerging diseases stem from the transmission of pathogenic agents from animals to humans, the factors that mediate this process are still ill defined. What is known, however, is that the interface between humans and animals is of paramount importance in the process. Improving our understanding of this interface will be crucial to future pandemic prevention efforts.

KEY WORDS: Pandemics, Epidemics, Pathogenics, Zoonotics etc.

INTRODUCTION

Coronaviruses are defined as the large family of the viruses which are much more similar to the SARS and MERS as the world has witnessed their effect earlier but it created a pandemic situation as earlier were the epidemic situation. There is no drug or medicine has been developed till now to cure this disease. Therefore to overcome this problem we basically need to develop some kind of medicine or vaccines. So to invent vaccine or medicines we must need to understand the structure of the virus. The coronavirus genome has single strand of **positive-sense of RNA**. Club-shaped glycoprotein spikes in the envelope give the viruses a crownlike, or coronal, appearance due which it has been named as the corona virus. The nucleocapsid which is made up of a protein shell known as a capsid and which contains the viral nucleic acids and it is helical or tubular in structure. Cell entry is mediated by the large glycoprotein spike, which binds to host receptors [**ACE 2**] and mediates fusion of the viral and host membranes. Once the virus enters into the human body it start damaging the human cells, the viral RNA synthesis complex is assembled which transcribe, edit and modify viral RNAs and remodel ER membranes to create RNA replication factories through which it makes protein of own desire. Expression of the viral structural proteins involves the RNA synthesis complex carrying out discontinuous strand synthesis to produce a new set of viral mRNAs. Discontinuous strand synthesis is essential for the production of new virions and understanding its mechanisms will shed light on related viral processes such as viral recombination to generate spike variants with altered host tropisms.[5].

COVID 19:OVERVIEW

Coronavirus is one of the most reluctant discussion in the current scenario in the field of medical sciences. Disease such as **SARS** and **MARS** are more related to this disease. This virus enters into the human species and transcribe within the human body which generally leads to infect the human drastically with some type of symptoms which is seen in the patient either in the **14 days** or after 14 days. The name “**coronavirus**,” coined in the year **1968**, and is derived from the word “**corona**”-like or crown-like morphology observed in the electron microscope. They have a large host range, which includes humans. However, the greatest amount of coronavirus diversity has been noticed in the pangolians and bats. the most common symptoms are fever, cough and sneezing. In fact, four types of human coronaviruses has been identified which cause 10 to 30 % of upper respiratory tract infections in adults. When germs are transmitted from an animal to a human, it’s called **zoonotic transmission**. or even we can say phase 4 or phase 5 which generally means direct transmission of the infection from animals to human which in other words even more worse condition then present scenario. This virus which we getting

infected from the bat whose intermediate host is still unknown generally infect our or human cells by weakening the immunity or damaging the antibodies or weakening them.[6]

Here are some examples of such coronaviruses:

- SARS-CoV, the virus that caused **SARS**, which was first identified in 2003
- MERS-CoV, the virus that caused Middle East respiratory syndrome (**MERS**), which was first identified in 2012
- SARS-CoV-2, the virus that causes **COVID-19**, which was first identified in 2019.

[7]

COMMON SOURCES OF ZOOONOTIC DISEASES

list of common animals and some of the diseases we can get from them:

1.Cats: taxoplasmosis; Pasteurella; ringworm

2.Bats: Ebola virus; SARS; MERS; rabies; Nipah virus; Hendra virus

3.Dogs: rabies; noroviruses; Pasteurella; salmonella; ringworm; hookworm

4.Ticks: Lyme disease; Rocky Mountain spotted fever; Powassan diseases

5.Mosquitoes: malaria; dengue; West Nile Virus; Zika virus; Chikungunya virus

6.Birds: bird flu (H1NI,H5N1); salmonella; psittacosis

7.Cows: Escherichia Coli; ringworm; salmonellosis

8.Rodents: Hantavirus pulmonary syndrome; plague; rat-bite fever; salmonellosis

DIFFERENT ZOOONOTIC INFECTIONS

1-WHAT IS SARS -COV ?

SARS coronavirus (SARS-CoV) – virus was first identified in the 2003. It is termed as the severe acute respiratory syndrome , SARS-CoV spread through the animals such as civet cats and then it leads to infect the human beings. Transmission of SARS-CoV is primarily from the person to person. It symptoms starts appears during the second week of illness, which corresponds to the peak of virus excretion in respiratory secretions and stools. Most cases has been found to be the asymptomatic in no any symptoms has been identified. There has been general Symptoms such as fever, pain, headache, or even dry mouth but no any No any specific symptoms has been proven for the diagnosis of SARS virus . Even though fever is the most frequently reported symptom, but however it is sometimes absent on initial measurement, especially in the adults and immunosuppressed patients.[8][9]

2-WHAT IS MERS-COV?

MERS is generally defined as the Middle East respiratory syndrome and it generally affect the respiratory tract of the human beings. The first ever case of MERS was identified in the 2012 at Saudi arabia. MERS diseases generally include symptoms like fever, cough and shortness of breath. Pneumonia is common in most of the cases but it is not always present. It also infect the Gastrointestinal tract of the humans and the symptoms include as diarrhoea . Many of the confirmed cases of MERS-CoV infection have been reported as asymptomatic which basically means that that they do not have any clinical symptoms then to they are showing positive response towards for MERS-CoV infection. Most of the human cases of MERS-CoV infections have been seen towards human-to-human infections in health care settings and through the research it has been witnessed that the dromedary camels has been the major reservoir host for MERS-CoV and an animal source of MERS infection in humans. Even though the complete transmission process of this virus have been not known completely till now. This virus infects the persons on when persons come in contact with the infected person either by being at the sneezing, or being at coughing site. The highest number of cases of this viruses or largest outbreaks have been seen in Saudi Arabia, United Arab Emirates, and the Republic of Korea.[10]

3-WHAT IS H1N1?

It is also being termed as the influenza A subtype virus.it widely affect the humans in the year of 2009 and it is widely considered as it has been associated with the 1918 flu pandemics .through the research it has been found that it contains orthomyxovirus which generally contains the glycoproteins such as haemagglutinin and neuraminidase which generally clumps the blood of our body and infect the humans cells.[11]

4-WHAT IS NIPAH?

Nipah virus infects human and leads to cause a wide range of symptoms from asymptomatic infection in which people which do not show any type of symptoms also get infected and it also leads to affect the respiratory tract and fatal encephalitis. The fatality rate of this virus has been estimated to be 40% -75%. .this virus can also be transmitted to humans from the animals which includes bats or pigs and even through the contaminated foods and can also be transmitted directly from human-to-human. it belongs to the family of Pteropodidae which are of fruit bats and they act as a natural host for the Nipah virus. Till now There has been no any medicines or vaccination has been developed to cure this disease and still research are going on.[12]

ORIGIN AND EMERGENCE—A COMPARITIVE STUDY

Although COVID 19 is most disturbing situation across the globe but the to it has been assumed that the SARS-CoV-2 originated from bats animals, the intermediate species is still unknown or uncertain through which it has spread to the human. but currently it has been assuming by the scientists that Pangolins and snakes are the current intermediate suspects. It generally affect the respiratory tract of the human beings and cough and sneezing are the common symptoms of this disease. Childrens below the age of 15 and geratics people above 55 years are more dominant. It is being considered is due to their immunity response in the body. The first outbreak of this zoonotic infections occurred in the 2002-SARS -COV then in the year 2012 MERS-COV hit the people and at present 2019 COVID -19.Somewhere or the others all this infections occurred in the china .But at present we do not have any evidences that these viruses has been prepared in the labs. Due these pandemics biological, clinical and socio-economics situation has to be faced by the people of the world. Researchers found that the genetic template for spike proteins are matures on the outside of the virus that it uses to grab and penetrate the outer walls of human cells or animal cells they focused on two important features of the spike protein: the receptor-binding domain (RBD), a kind of grappling hook that grips onto host cells, and the cleavage site, a molecular can be the opener that allows the virus to crack open and enter host cells.

ORIGIN AND TRANSMISSION OF COVID-19

The SARS-CoV-2 is found to be in the category of β -coronavirus, which is enveloped or described as the positive-sense RNA virus [13]. COVID-19 are divided into four genera, including α -/ β -/ γ -/ δ -CoV. α - and β -CoV are capable to infect mammals while γ - and δ -CoV tends to infect birds. According to the earlier studies 6 CoVs have been identified as human-susceptible virus, among which α -CoVs HCoV-229E and HCoV-NL63, and β -CoVs HCoV-HKU1 and HCoV-OC43 are found with the low pathogenicity, and they cause mild respiratory symptoms which are similar to a common cold & cough respectively. Rest two known β -CoVs, SARS-CoV and MERS-CoV lead to severe and potentially fatal respiratory tract infections [14]. Scientists on the basis of their research analysis they found that the genome sequence of SARS-CoV-2 is 96.2% identical to a bat CoV RaTG13, whereas it also shares 79.5% identity to SARS-CoV. SARS-CoV-2 uses angiotensin-converting enzyme 2 (ACE2), the same receptor as SARS-CoV [15], to infect humans beings. Through this they enters into the human cells and starts manipulating or adultering the synthesis of proteins. They interrupts into the various stages such as transcription as well as translation. It also leads to affect the metabolism of the human beings.

COVID-19 appears to transmit more easily than other zoonotic outbreaks.

In contrast to the role of camels in the transmission of MERS-CoV, the role of pangolins, if there is any, in the transmission of SARS-CoV-2 is different. Particularly, pangolin beta-CoVs are highly pathogenic in pangolins. They might be a dead-end host for SARS-CoV-2-related beta-CoVs, similar to civets in the case of SARS-CoV. Several possibilities for interspecies transmission of SARS-CoV-2 from animals to humans have to be ruled in or ruled out in future studies. [16]

1-bats could be the reservoir host of a SARS-CoV-2-related virus almost identical to SARS-CoV-2. Humans might share the ecological niche with bats through butchering or coal mining.

2-pangolins could be one of intermediate amplifying host to which a SARS-CoV-2-related virus had been newly introduced. Humans contract the virus through butchering and consumption of game meat. It is possible that many mammals including domestic animals are susceptible to SARS-CoV-2. A survey of domestic and wild animals for antibodies is warranted.

3-recombination and adaptation of SARS-CoV-2 might have occurred in a third species that has contact with both bats and pangolins. The search for the animal origins of SARS-CoV-2 is still on.

POSSIBLE THEORY OF THE ORIGIN OF COVID-19 VIRUS:

1. In one of the possibilities it has been states that the virus evolved to its current pathogenic state that the viruses has been transmitted through the animals to humans. This also have been the same scenario during the previous zoonotic infections outbreaks with humans comes in contact with the virus after direct exposure to civets (SARS) and camels (MERS). They also proposed through their research that they consider bats as the most likely reservoir for SARS-CoV-2 because it is very similar to a bat coronavirus. Till now there has been no any evidence that these viruses has been direct transmitted through the bat to the humans. However researchers assume that an intermediate host is likely to be involved between bats and humans. In this possibilities both of the distinctive features of SARS-CoV-2's spike protein portion that binds to cells and the cleavage site that opens the virus up would have evolved to their current state before they enters to humans cells.
2. In the second possibilities or scenario it has been assumed that a non-pathogenic version of the virus jumped from an animal host into humans and then they get evolved to its current pathogenic state within the human population. some of the coronaviruses from pangolins and armadillo-like mammals found in the area of Asia and Africa they have been found to have an RBD structure which is very much similar to the SARS-CoV-2. A

coronavirus from a pangolin can be the one of the possibilities that they have possibly been transmitted to a humans either directly or through an intermediary host such as civets or ferrets.[17]

A viral quasi species

A **viral quasi species** is a population structure of **viruses** with a large numbers of variant genomes (related by mutations). **Quasi species** result from high mutation rates as mutants arise continually and change in relative frequency as **viral** replication and selection proceeds. Previous studies have shown that SARS-CoV mutated over the 2002–2004 epidemic to better bind to its cellular receptor and replication in human cells, enhancing virulence. It is thus important to examine whether 2019-nCoV behaves like SARS-CoV to adapt to the human host and whether this would increase and change its virulence. Notably, ACE2, the receptor protein of both SARS-CoV and 2019-nCoV, is abundantly present in humans in the epithelia of the lung and small intestine and coronaviruses can infect the upper respiratory and gastrointestinal tract of mammals. In this regard, identifying the possible route of infection will also have implications for the pathogenesis and treatment of disease caused by 2019-nCoV.[18] COVID-19 appears to transmit more easily than SARS. One possible explanation is that the amount of virus, or viral load, appears to be highest in the nose and throat of people with COVID-19 shortly after symptoms develop. This is in contrast to SARS, in which viral loads peaked much later in the illness. This indicates that people with COVID-19 may be transmitting the virus earlier in the course of the infection, just as their symptoms are developing, but before they begin to worsen. According to the Centres for Disease Control and Prevention (CDC) Trusted Source, some research suggests that COVID-19 can be spread by people who aren't showing symptoms. Another difference between the two illnesses is the fact that there haven't been trusted source any reported cases of SARS transmission before symptom development.[19]

CLASSIFICATION:

Coronaviruses are named because it has a crown like spikes on their surface. There are generally four main sub-group of coronaviruses which are known as Alpha, Beta, Gamma, Delta. There are 7 viruses which has been seen which basically infect the humans are:

1-229E(Alpha)

2-NL63(Alpha)

3-OCR3(Beta)

4-HKU1(Beta)

5-MERS-CoV(Beta)[Causes middle east respiratory syndrome]

6-SARS-CoV(Beta)[Causes severe acute respiratory syndrome]

7-SARS-CoV2[Novel coronavirus 2019]

People around the world generally get infected through the 229E, NL63, OCA43, & HKU1.[20,21,22,23]

GENOME STRUCTURE

The genomic structure of CoVs has been that it is a single-stranded positive-sense RNA with 5'-cap structure and 3'-poly-A tail. Its RNA is used to translate polyprotein 1a/1ab (pp1a/pp1ab), which encodes non structural proteins to form the replication-transcription complex in a double-membrane vesicles. sub genomic mRNAs possess common 5'-leader and 3'-terminal sequences. Transcription termination and subsequent acquisition of the RNA occurs at transcription regulatory sequences which are located between the open reading frames. These minus-strand sgRNAs serve as the templates for the production of sub-genomic mRNAs. The genome and sub-genomes of a typical CoV together contain at least six ORFs. The first ORFs (ORF1a/b), about two-thirds of the whole genome length, encode 16 nsps except for the Gamma-coronavirus which lacks nsp1. There is a 1 frameshift between ORF1a and ORF1b which leads to the production of two polypeptides: pp1a and pp1ab. These polypeptides are processed by virally encoded chymotrypsin-like protease (3CLpro) or main protease (Mpro) and one or two papain-like protease into 16 nsps. Other ORFs on the one-third of the genome near the 3'-terminus encodes at least four main structural proteins: spike, membrane, envelope, and nucleocapsid proteins. Apart from these four main structural proteins, different CoVs encode special structural and accessory proteins, such as HE protein, 3a/b protein, and 4a/b protein. All the structural and accessory related proteins are being translated from the sgRNAs of CoVs. The 3'-5' exonuclease is being common to CoVs among all the RNA viruses, probably providing a proofreading function of the RTC. Sequence analysis shows that the 2019-nCoV possesses a typical genome structure of CoV and belongs to the cluster of beta-coronaviruses that includes Bat-SARS-like (SL)-ZC45, Bat-SL ZXC21, SARS-CoV, and MERS-CoV. By the analysis of the research it has been seen that 2019-nCoV is more closely related to bat-SL-CoV ZC45 and bat-SL-CoV ZXC21 and more distantly related to SARS-CoV. [24][25][26][24][28][29][24][30][31].

EPIDEMIOLOGY OF THE VIRUSES:

These zoonotic infections are susceptible to all age groups be it children, adults or even older. this infection is transmitted through the communication between the peoples which includes coughing & sneezing of the patient due to which leads to infect the respiratory tract and throat. They also leads to affect the people who carry low immunity in their body. But presently it has also been seen that people who have the high immunity they are also been affected equally. [35] person will be infected by the viruses as long as the person will have the symptoms of the viruses till the time it not get reduce its activity of metabolism in the human body. Those patients who carry the disease or who are infected leads to infect the other person who come in contact with him [33]. These can infect the people who come in contact within the range of 1-2metre. some of these viruses have less shelf life but some of them have long shelf life with the help of favourable atmospheric condition. These virus can be destroyed by the some of the common disinfectants such as sodium hypochlorite, hydrogen peroxide etc. which are generally termed as sanitizers in which alcohol are present in large quantity which helps to kill them. [36] This virus has also been found to be present in the stool and contamination of the water supply and subsequent transmission via aerosolization or even with the oral route is also been hypothesized [33][37][37]. The incubation period varies from viruses to viruses but and at an average 2 to 14 days has been noticed. as per the latest research it has been seen that the angiotensin receptor 2 (ACE2) which is the receptor found in the cytosol through which

the virus enters the respiratory mucosa and infect the human body [34]. The basic case reproduction rate (BCR) is recorded to range from 2 to 6.47 . In comparison, the BCR of SARS is found to be 2 and 1.3 for pandemic flu H1N1 2009 [32].

CLINICAL SYMPTOMS:

Till now there has been no significant symptoms has been found yet to whom we consider as the symptoms are particular for this virus. But the common symptoms which has been found by the scientists are fever which is low at the start and then gets into the high as day passes. Dry cough and tiredness are the most common symptoms has been identified till now but there has been no any confirmation yet. Other are infection in the respiratory tract, nasal congestion, headache , sore throat and gastrointestinal infection such as diarrhoea are common symptoms. Vomiting , tiredness and loss of blood count are the other symptoms. This disease is affective to those person have some previous running disease in their body such as diabetes & cancer etc. [39][40,41][51][52][53][48][54][38][39] [45].

DIAGNOSTIC CRITERIA :

In the present scenario there are only few experimental tools or kits are present to detect this virus, through this we come to know that which person is suffering from this disease.one of the first tool which we start using to detect the infected person is by the blood sample. through the blood sample we come to know the result within a few hours. Second one is thermal screening in this we generally detect the raised temperature of the person. some of the scientist believe that viruses can detected with the rise of the body temperature as increase in body temperature is one of it's symptoms. In country like china they use koch's postulates then they observe through the electron microscope. Some of the other tools are golden diagnosis in which nucleic acid detection is done by nasal or respiratory tract sample and then further confirmed by the next generation sequencing. While we also detect the infected patient by comparing CT and RT-PCR viral nucleic acid testing. If the person result has been found positive then we must check the patient last 15-20 days travel history and also identify with he/she meet and which are the persons who have come in contact in that tenure.it is also been believed that the symptoms occurs only after the 12-14 days and people who come in contact with that person also gets infected.[47]

MECHANISM OF ACTION

[48] till now the whole concept of COVID 19 has not been known how its mechanism works are still in research level. But till some extent we find its action and its working . first of all it all starts by coming in contact with the infected person which eventually leads to the comes into our body through the respiratory tract then it attacks the human lungs . this virus has been found to be as the positive single stranded RNA . due to this structure it is very fast in replicating itself and also leads to modify own structure more frequently. This virus take help of the ACE 2 [Angiotensin converting enzyme] through which it enters into our body and forms a vesicles later on the vesicles comes in contact with lysozyme which leads to diffuse it and release of the viruses into the cytoplasm and combine with the ribosomes and forms a protein which eventually leads to the reproduction of many more viruses into our body and similarly leads to many more damage of the cells.

MEDICATION USED FOR COVID 19

1.Tocilizumab

It is also known as atilizumab and it is an immunosuppressive drug. It is generally being used for the treatment of rheumatoid arthritis and systemic juvenile idiopathic arthritis and also in the severe form of arthritis in children. It is a humanized monoclonal antibody against the interleukin-6 receptor.

2.Itolizumab

It is a 'first in class' humanized IgG1 monoclonal antibody. It selectively targets CD6, a pan T cell marker involved in co-stimulation, adhesion and maturation of T cells.

3.Cipremi

This medicine is lyophilized powder for injection 100mg. This drug is more effective to those patients who need oxygen.

4.Fabiflu

It has faster symptomatic and radiological improvement.

OTHERS MEDICATIONS:

Calquence (acalabrutinib)

Xeljanz (tofacitinib)

Jakafi (ruxokitinib)

Olumiant (baricitinib)

Kineret (anakinra)

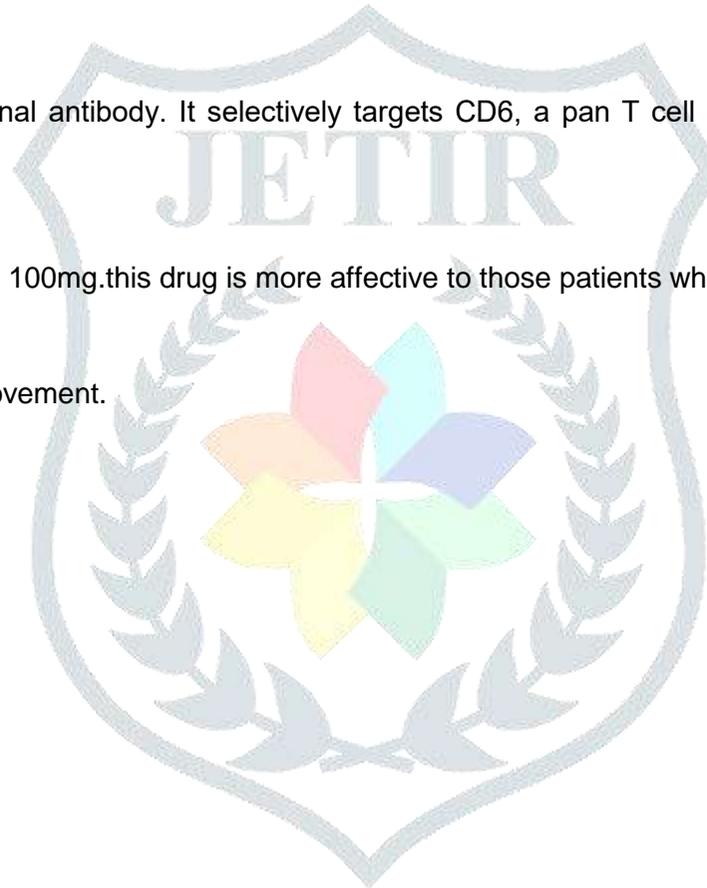
Llaris (canakinumab)

Otezla (apremilast)

mavrilimumab

5. kevezara (sarilumab)

Its mechanism of action is much more similar to the tocilizumab. It is only given during the critical conditions.



6. kaletra (lopinavir/ritonavir)

It is a HIV medication which is used in the combination with the lopinavir and ritonavir. and it is also being used with the combination with interferon beta -1b and ribavirin.

7.covifor

It is drug which is given intravenously. Six doses of medicine is given in its timeframe.

8.chloroquine/ hydroxychloroquine

It is an anti malarial drugs which is used to treat the malaria diseases. it till large extent it does not allow the SARS-COV2 viruses to attach to the cells of the human body.

9.Plasma therapy

It is a type of therapy which has been used widely it is basically done by the extraction plasma from person who get recovered from COVID-19 or have the high immunity inside the body.

10.remedesivir

It is an anti viral medication and it has been seen that it is active against SARS and MERS which used on the animal models,

11. dexamethasone/methylprednisolone

It is an corticosteroidal drug which is used treat autoimmune disease and allergic diseases and it shows significant response against SARS and MERS.

12.ivermectin

It is a medication which is generally being used to treat the infections diseases which are caused by the parasites. it inhibit the viruses to replicating with the human body.

Some of the other medications which has used as the combination to treat the COVID 19 are ritonavir +lopinavir and doxycycline +ivermectin.

[49][50][51] [52] [53][54][55] [80][57][56][58][59][60][61] [62][63]

PREVENTION:

As we know that there has been no any specific medication or vaccine has been found yet. But there has been some of the guidelines which has been issued by the scientists and WHO which help us to get prevent from the viruses. And we also knew that "PREVENTION IS BETTER THAN CURE". Mass gathering should be avoided because it has been found that it can easily communicated from one person to others due to the contact from each others. We must wash our hands from time to time for not less than 20 sec. we should use sanitizers more frequently and sanitizer must contain not less than 60% alcohol. We must keep social distancing from the people for atleast 2metre . if we feel illness then we must contact

to the physician. If the any of the person which has been found positive test than he/she must be quarantined. Avoid as much as possible to go out of the home unless and until it is necessary. And also sanitize the stuffs which we take from the markets . and we must use masks and gloves wherever we go outside the home. [64-70][71,72]

CONCLUSION:

It has been seen that every viruses have there different structure as well as their mechanism of action. their way of affecting the individual is different and also time to time their medication and their vaccines came . we have also observe that there are very less difference in their genomic structure but their way of affecting the humans are completely different .we have witness that how different viruses at the different time affect the human which ultimately leads to death of the large population of the human beings. We have seen that suddenly vaccination has not come as soon as it affected the human it took a little time by the scientists but till then we must ensure our health and our family health and took all major steps which is necessary and follow the WHO guidelines as well as the governments guidelines.

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COMPARISON OF COVID 19 WITH PAST ZONOTIC INFECTIONS

Virus	Year identified	Cases	Deaths	Fatality rate	Number of countries
Ebola	1976	33,577	13,562	40.40%	9
H5N1 BIRD FLU	1997	861	455	52.80%	18
Nipah	1998	513	398	77.60%	2
SARS	2002	8,096	774	9.60%	29
H1N1	2009	More than 762,630,000	284500	0.02%	214
MERS	2012	2,494	858	34.40%	28
2019-CoV	2020	3500000	200000	-	200

BIOLOGICAL AND CLINICAL CHARACTERISTICS OF ZONOTIC INFECTIONS

CHARACTERISTICS	SARS-COV	MERS-COV	COVID-19
VIRUS	POSITIVE SENSE SINGLE STRANDED RNA	POSITIVE SENSE SINGLE STRANDED RNA	POSITIVE SENSE SINGLE STRANDED RNA
SOURCES OF ORIGIN	BATS,CIVETSCATS	BATS,CAMELS	SEAFOODS,SNAKES,BATS
TRANSMISSION	ANIMAL-HUMAN HUMAN-HUMAN ZONOTIC DISEASES	ANIMAL-HUMAN HUMAN-HUMAN HUMAN-HUMAN ZONOTIC DISEASES	ANIMAL-HUMAN HUMAN-HUMAN ZONOTIC DISEASES

INCUBATION PERIOD	2-10(7)DAYS	2-10(5.5)DAYS	2-14(5.2)DAYS	
SPEED OF SPREAD	MODERATE	LOW	HIGH	
MEDIAN AGE OF EFFECTED PEOPLE	65 YEARS	50 YEARS	59 YEARS	
MALE/FEMALE	MALE PREDOMINANCE	MALE PREDOMINANCE	MALE PREDOMINANCE	
SEAONAL OCCURRENCE	WINTER(DEC-JAN)	SUMMER(MAY-JULY)	WINTER(DEC-JAN)	

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S.A. MEO¹, A.M. ALHOWIKAN¹, T. AL-KHLAIWI¹, I.M. MEO¹, D.M. HALEPOTO¹, M. IQBAL¹, A.M. USMANI², W. HAJJAR³, N. AHMED⁴

PHYLOGENETIC,PATHOGENETIC AND EPIDEMIOLOGICAL CHARACTERISTICS

	PHYLOGENETIC ORIGIN	ANIMAL RESERVOIR	INTERMEDIATE HOST	RECEPTORS	CASE FATALITY	Ro	
SARS-COV	CLADEI,CLUSTERIib	BATS	PALM CIVETS	ACE2	9.5%	2.3%	
MERS-COV	CLADEII	BATS	CAMELS	DPP-4	34.4%	0.7	
COVID 19	CLADE I,CLUSTER Iib	BATS	UNKNOWN	ACE 2	2.3%	2-2.5	

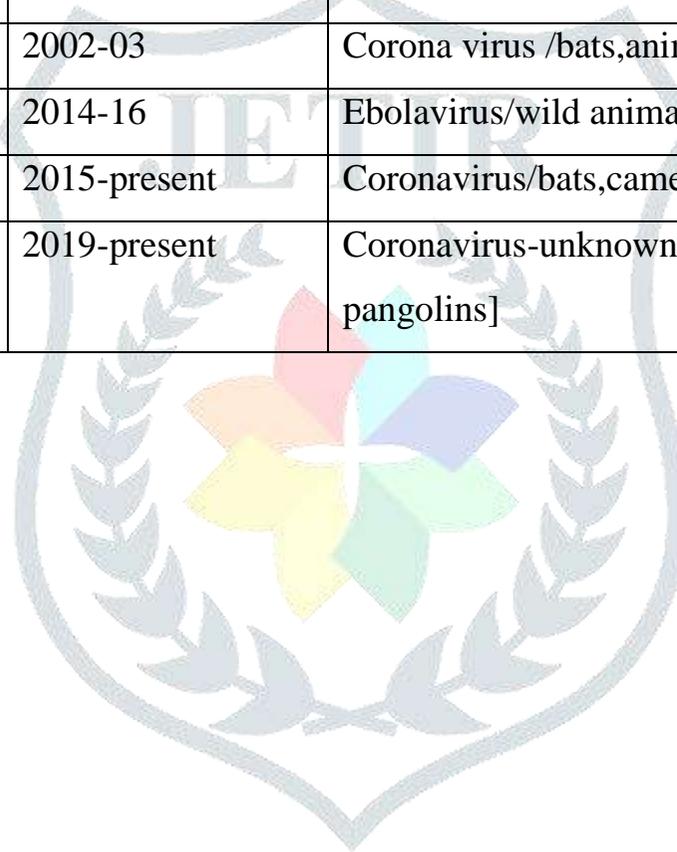
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PANDEMICS WHICH HAVE OCCURRED OVER TIMES

NAME	TIME PERIOD	TYPE/PRE-HUMAN HOST	DEATH TOLL
ANTONINE PLAGUE	165-180	Believed to be either smallpox or measles	5M
JAPANESE SMALL POX	735-737	Variola major virus	1M
PLAGUE OF JUSTINIAN	541-542	Yersinia pestis bacteria/rats/fleas	30-50M
BLACK DEATH	1347-51	Same	200M
NEW WORLD SMALLPOX OUTBREAK	1520-onwards	Variola major virus	56M
GREAT PLAGUE OF LONDON	1665	Yersinia pestis bacteria/rat/fleas	100,000
ITALIAN PLAGUE	1629-31	Same	1M
CHOLERA PANDEMICS	1817-1923	V.cholera bacteria	1M+
THIRD PLAGUE	1885	Yersinia pestis bacteria/rat/fleas	12M[INDIA+CHINA]
YELLOW FEVER	Late 1800s	Virus/mosquitoes	1000,000-150,000[US]
RUSSIAN FLU	1889-90	Believed to be H2N2[avian origin]	1M

SPANISH FLU	1918-19	H1N1 virus /pigs	40-50M
ASIAN FLU	1957-58	H2N2 virus	1.1M
HONGKONG FLU	1968-70	H3N2 virus	1M
HIV/AIDS	1981-present	Virus/chimpanzee	25-35M
SWINE FLU	2009-10	H1N1 virus/pigs	200,00
SARS	2002-03	Corona virus /bats,animals	770
EBOLA	2014-16	Ebolavirus/wild animals	11000
MERS	2015-present	Coronavirus/bats,camels	850
COVID-19	2019-present	Coronavirus-unknown[possibly-pangolins]	MORE THAN 1 LAKH



COMPARISON OF COVID 19 WITH OTHER ZONOTIC DISEASES

Virus	Source/ Emergence	Transmission	Incubation period	Symptoms	Prevention/ Treatment	Citations
SARS	First reported in 2002 in Southern China. Believed to have spread from bats, which infected civets.	Mainly transmitted between humans through close contacts.	The incubation period for SARS is typically 2 to 7 days, although in some cases it may be as long as 10 days.	SARS symptoms are similar to the flu, including: <ul style="list-style-type: none"> • fever over 100.4°F • dry cough • sore throat • problems breathing, including shortness of breath • headache • body aches • loss of appetite • malaise • night sweats and chills • rash • diarrhoea 	Prevention: <ul style="list-style-type: none"> -Good hand hygiene -surgical mask -gloves -pay attention to what surface you touch. -Infected should cover their mouth when they sneeze or cough. Treatment: <ul style="list-style-type: none"> -No uniform treatment for sars. -Intensive care and observations. -Antiviral medications and steroids are sometimes given to reduce lung swelling. 	4, 5, 6
MERS	First reported in 2012 in Saudi Arabia.	Often from touching camels or consuming their milk or meat. Limited transmission	The incubation period is about five days, but it can occasionally be up range from two to 14 days.	<ul style="list-style-type: none"> • Fever • cough • shortness of breath. • Pneumonia • diarrhoea 	Prevention: <ul style="list-style-type: none"> • -Wash your hands • -Cover your nose and mouth with a tissue when you cough or sneeze, then throw the tissue in the trash. 	7, 8,9,10.

		<p>between humans through close contacts.</p>		<ul style="list-style-type: none"> • nausea/vomiting 	<ul style="list-style-type: none"> • -Avoid touching your eyes, nose, and mouth with unwashed hands. • -Avoid personal contact. • -Clean and disinfect frequently touched surfaces and objects, such as doorknobs. • Treatment: • -Often require oxygen supplementation, and severe cases require mechanical ventilation and intensive-care-unit support. • - No medication has been proven to treat MERS-CoV, and treatment is based upon the patient's medical condition. 	
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H1N1	First detected in the United States in April 2009.	Transmitted to humans via contact with infected pigs or environments contaminated with swine influenza viruses.	The known incubation period for H1N1 swine flu ranges from 1 to 4 days, with the average around 2 days in most individuals, but some individuals, it may be as long as 7 days.	<p>The symptoms of swine flu are similar to those of infections caused by other flu strains and can include:</p> <ul style="list-style-type: none"> • Fever (but not always) • Chills • Cough • Sore throat • Runny or stuffy nose • Watery, red eyes • Body aches • Headache • Fatigue • Diarrhea • Nausea and vomiting <p>Flu symptoms develop about 1-3 days after you're exposed to the virus.</p>	<p>Prevention:</p> <ul style="list-style-type: none"> • washing hands regularly with soap and water • getting plenty of sleep • exercising often • managing stress • drinking liquids • eating a balanced diet • avoiding being close to someone with flu symptoms • not touching surfaces that may have the virus <p>Treatment:</p> <ul style="list-style-type: none"> • Gave antiviral drugs which can shorten the duration of symptoms and reduce their severity. 	11, 12, 13, 14
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NIPAH	Nipah virus was first discovered in 1999 following a large outbreak in Malaysia and Singapore. Sizeable outbreaks also occurred in West Bengal, India in 2001, and in Bangladesh in 2004.	Nipah virus can be transmitted to humans from animals (such as bats or pigs), or contaminated foods and can also be transmitted directly from human-to-human.	The incubation period is believed to range from 4 to 14 days. However, an incubation period as long as 45 days has been reported.	<ul style="list-style-type: none"> • Fever • headaches • myalgia (muscle pain) • vomiting • sore throat • indicate acute encephalitis (dizziness, drowsiness, altered consciousness, and neurological signs). 	<p>Prevention:</p> <ul style="list-style-type: none"> -Nipah virus infection can be prevented by avoiding exposure to sick pigs and bats in endemic areas and not drinking raw date palm sap. <p>Treatment:</p> <ul style="list-style-type: none"> - Treatment is limited to supportive care. The drug ribavirin has been shown to be effective against the viruses. 	15,16,17
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Comparing Novel Corona with related infections.[13]

	Wuhan Coronavirus (2019-nCoV)	Middle East respiratory syndrome(MERS)	Severe acute respiratory syndrome(SARS)	Common Cold caused by coronavirus
Origin	First reported in December 2019 in Wuhan, China.	First reported in 2012 in Saudi Arabia.	First reported in 2002 in Southern China.	Four coronavirus strains are thought to be responsible for 15-30% of common colds.
Transmission	Likely, from touching or eating an infected, as yet unidentified animal. Human-to-human transmission occurs through close contact.	Often from touching infected camels or consuming their milk or meat. Limited transmission between humans through close contact.	Believed to have spread from bats, which infected civets. Transmitted mainly between humans through close contact.	Close contact with infected humans or touching a surface that carries the virus.
Cases	Around 500 confirmed; 17 deaths as of Jan.22. Some victims were older males with pre-	2,494 confirmed cases; 858 deaths (as of Nov.30, 2019). Mortality rate of 34%.	8,098 cases; 774 deaths. Mortality rate of about 10%.	Millions each year. Generally nonlethal with rare exceptions.

	existing conditions.			
Current Status	Cases mainly reported in Wuhan, as well as others parts of China and Asia. One case reported in U.S.	All cases linked to Arabian Peninsula, with 80% in Saudi Arabia. Others in about two dozen countries, including U.S. Cases and deaths have been declining since 2016.	No new cases reported since 2004. 87% of previous cases in China and Hong Kong.	Circulates year-round, but more common in fall/winter.

COMPARISON OF ACTION TAKEN BY VARIOUS COUNTRIES GOVERNMENTS

		India	Italy	United States	Germany
Demographics	<i>Population</i>	1.36 billion	60.48 million	331 million	82.9 million
	<i>Area</i>	3.29 million sq m	301,338 sq km	9.8 million sq km	357,386 sq km
Time - line	<i>First Case</i>	January 30, 2020	January 31, 2020	January 21, 2020	January 27, 2020
	<i>Travel Restrictions</i>	February 05, 2020	January 23, 2020	February 2, 2020	January 29, 2020
	<i>Ban on Events</i>	March 10, 2020	February 22, 2020	March 11, 2020	March 10, 2020

	<i>Border isolation</i>	March 16, 2020		March 19, 2020	March 16, 2020
	<i>National Lockdown Start</i>	March 22, 2020	March 8, 2020	March 24, 2020	March 22, 2020
	<i>National Lockdown Duration</i>	40 days	56 days	-	28 days
Evaluation	<i>Number of days till start of lock down since first reported case</i>	52 days	37 days	63 days	55 days

