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Review Article

Pharmaceutics for Enhanced Drug Delivery

Coronavirus (Covid-19) - The New Global Pandemic

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Abstract: A novel coronavirus (SARS-CoV-2) originated from the Human Seafood Market in Wuhan, China. World Health Organization named it as COVID-19 which spread quickly all over the country and the world. The sources and the pathogenesis characteristics of this virus are still unidentified. In the meantime, many independent researcher groups have identified that the SARS-CoV-2 belongs to β-coronavirus with identical genome sequence to bat coronavirus, and pointing out that bat is the natural host. The COVID-19 utilizes the similar receptor angiotensin converting enzyme-2 (ACE-2) as like SARS-CoV and commonly spreads via the respiratory tract infection. The clinical sign and symptoms of COVID-19 include cough, fever, fatigue, headache and breathing problem. The elderly patients and people with underlying disorders are more susceptible to infection and prone to serious effects which may be associated with some of the acute respiratory distress syndrome. There is no specific treatment such as vaccination and therapeutic drug molecule has not been found. Currently, some antiviral drugs are in used for the treatment of coronavirus but they are not that much effective. In this review article, we focus on the general overview and pathogenesis characteristics of COVID-19. In this we have discussed the various vaccination strategies, use of traditional medicine system and convalescent plasma therapy for the treatment of coronavirus. Also we highlight the break chain theory which helps to avoid the transmission of virus from one human body to another. The worldwide impact of this epidemic is still undetermined.

Keywords: COVID-19, SARS-CoV-2, SARS CoV, MERS CoV, clinical symptoms, break chain theory.

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1. INTRODUCTION

A cluster of pneumonia known as the severe acute respiratory syndrome (SARS) or the novel coronavirus (COVID-19) is first detected in December 2019 from Wuhan City, Hubei Province of China[1]. It is quickly spreading from china to the rest of the world. At the end of December, the Chinese health authorities detected more than 40 infected cases which all were interrelated to exposure in sales of aquatic products, Seafood market, wild animal and poultries[2]. In the end of January 2020, more than 9720 were confirmed and 15,238 suspected cases reported throughout China[3]. By the first week of March 2020, total 79,969 cases of COVID-19 have been proved in China with 2873 deaths[4]. More upsettingly, the COVID-19 cases were also confirmed in other neighboring countries like Japan, Vietnam, Finland, Iran, Italy, Canada, Australia and India. The Emergency Committee of WHO declared that COVID-19 is a public health crisis of international concern[5]. India has reported more than 67 lacs cases of COVID-19 out of which 58 lacs recovered and more than 90,000 thousand deaths till date (October 6, 2020)[6].The rapidly spreading of COVID-19 is likely to be ambitious by the fact of 'super-spreading'. Super-spreading is known as the fine transmission of the disease as a minimum of eight contacts and which has been noted in the other infectious diseases such as SARS, influenza and MERS[7-8]. The transmission speed is important factor for the difference between two viruses for example the incubation period for influenza is 3-4 days and for coronavirus is 5-6 days. The Studies reported that the basic reproduction number of COVID-19 around 1.4 to 6.5 and rapidly growing by human to human transmission[9-10]. The global spread rapidity of COVID-19 is because of modern air travel. The air travel allows passengers to traverse the globe in less than a day. This allows the viruses to rapidly spread across continents, and efforts at airport screening to halt them have been fairly ineffective and costly[11-12]. This is in addition to the potential for in-flight transmission of the virus among passengers that was observed with SARS[13]. The virus is rapidly evolving but the future of this virus is still unknown. In this short report we have summarized the general overview and break chain theory of it (social distancing) [14].

1.1 CORONAVIRUSES PATHOGENESIS

Coronavirus is a positive single strand RNA virus around 60 to 140 nm in diameter from family Coronaviridae and subfamily Orthocoronavirinae[15]. The subfamily of coronavirus is divided into four genera (α, β, γ, and δ)[16]. Mainly six types of coronaviruses which are active to infect human beings include α genus (229E, NL63), OC43, HKU1, MERSr-CoV and β genus (SARSr-CoV).[17-18]The coronavirus (SARS-CoV-2) isolated from the patients lower respiratory tract with unidentified pneumonia. It is a latest type of virus which belongs to β genus which is different from SARSr-CoV and zoonotic MERSr-CoV. It is the seventh most popular coronavirus that highly infect human beings[19-20]. The phylogenetic study of coronaviruses full-length genome sequences illustrated that the SARS-CoV-2 genetic makeup quite similar to bat coronavirus but lower similarity with MERS-CoV (20%–60%). [21] Hence, bat is certainly the original host which is responsible for the SARS-CoV-2. When SARS-CoV-2 genome compared with the SARS-CoV and MERS-CoV genome, it is quite closer to the SARS-CoV (45-90 %) in provisions of whole genome sequence, based upon the sequence of genome and evolutionary analysis stated that they are quite similar but in case of SARS-CoV-2 it is transmitted via bats to unknown hosts to infect human beings[17, 19]. Coronavirus is pleomorphic in nature and carries the S protein gene which is the key target antigenic proteins.[22] The S-protein has the ability to interact with human angiotensin-converting enzyme-2 (ACE-2) and possesses a major public health threat[23]. The coronaviruses are sensitive to heat, ethanol, ether, chlorine disinfectant and peracetic acid because these all agents helps to dissolve the outer lipid protein layer. It can be killed when exposed to higher temperature (above 50 °C) for 30 minutes[24].

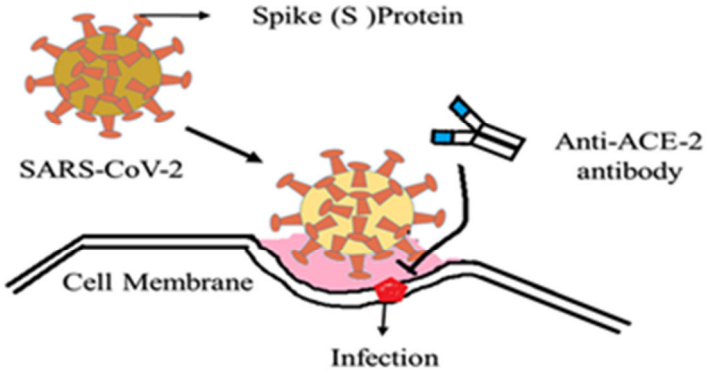

Fig 1.Structure and mechanism of action of coronavirus[17]

1.2 CLINICAL FEATURES OF COVID-19

COVID-19 is an acute respiratory infectious disease mainly spread via the respiratory tract, secretions, by droplets, and direct/indirect contacts. [25-26]The SARS-CoV-2 was isolated from blood and fecal swabs of a pneumonia patient in February 2020.[27] It can be transmitted in the body through various routes cause respiratory infection, progress to pneumonia and ultimately cause death by respiratory failure. The SARS-CoV-2 binds to ACE-2 protein present on the lung alveolar epithelial cells and small intestine cells, which helps to understand the routes of infection[19]. The growth of SARS-CoV-2 is linked with levels of inflammatory cytokines in the body including IL2, IL7, IL10, IP10, GCSF, MCP1, MIP1A, and TNFα[28]. The most common clinical features of COVID-19 include fever, sore throat, headache, cough, fatigue, myalgia, breathlessness and conjunctivitis. Based on investigation, COVID-19 is contagious in nature and the incubation period was observed 1–14 days[29]. It is extremely transmissible in humans particularly in the elder people. The adverse outcomes and deaths are common in the elder patients with the underlying comorbidities. It has also been reported in neonates, infants and children who are significantly milder infected than the elder people. The SARS-

CoV-2 patients found with critical infections like mild flu-like symptoms, respiratory distress syndrome, multiple organ failure and respiratory failure[30].In the early stage of SARS-CoV-2, the total number of blood leukocytes and lymphocyte count is normal or decreased. Some of the patients examined had a high level of liver enzyme, elevated troponin level, myoglobin and elevated C-reactive protein (CRP). [31] The COVID-19 patient chest imaging presented multiple small patch shadows and interstitial changes in the extrapulmonary zone. In critical cases, multiple ground glass shadows and lung consolidation may also occur[30].

1.3 DIAGNOSIS OF COVID-19

The diagnosis of coronavirus was based on a series of clinical studies. A COVID-19 suspect case is one who has fever, sore throat, cough and history of travel to China or contact with the patients of SARS-CoV-2 infection[28]. A suspect case with epidemiological history within weeks before disease onset, contacted the people who have confirmed COVID-19, clustering, fever and respiratory symptoms. The confirmed cases are identified with real-time RT-PCR or gene sequencing, sputum, throat swab and lower respiratory tract infection[27].

1.4 LABORATORY DIAGNOSIS

The diagnosis study of viral pneumonias caused by SARS-CoV-2 involves the sample collecting from the patient at the correct time. The human coronavirus have been determined from lower and upper respiratory tract sources such as throat, sputum, nasal and bronchial fluid. It was reported that the nasopharyngeal (NP) swabs are significantly better than the oropharyngeal (OP) swab. Earlier the SARS-CoV-2 RNA was diagnosed in china more frequently with the help of OP swabs but later it was noted that these were less active as compared to NP swabs[32].In SARS-CoV-2 infection the collection of sample and testing of both lower and upper respiratory includes sputum and bronchoalveolar lavage fluid (BAL). But, the specimen collection from sputum and BAL through bronchoscopy increases the risk of biosafety to healthcare workers via the making of aerosol droplets. That's why the suitable use of personal protective equipment (PPE) is necessary for the healthcare workers. The bronchoscopy is a technical procedure and requires well trained staff which may not be accessible in many parts of the world. The collections of specimen from upper respiratory are very easy and speed up the process of testing for patients with moderate symptoms[33].Self-collected saliva sample may be tested positive in 11to 12 days for COVID-19 patients and suggesting a non-invasive specimen for diagnosis and monitoring of SARS-CoV-2 infections. One another detection technique for SARS-CoV-2 is serum sample diagnosis but only 15% pneumonia patients who were hospitalized had detected positive with RNA in serum. The sample collected for laboratory testing should be placed in refrigerated for 72 h at−70°C or below temperature[34]. The biosafety guidelines of U.S. CDC states that the routine diagnostic analysis of sample from suspected/confirmed SARS-CoV-2 patients, should can be handled in a BSL-2 laboratory by using standard precautions. [35] The US CDC developed a RT-PCR Diagnostic technique for universal detection of beta-coronaviruses SARS-CoV-2. There are three separate RT-PCR reactions which target the N gene, one probe set that detects all the beta-coronaviruses, second set are particular for the SARS-CoV-2. In confirmed case, all 3 assays must be positive to report for SARS-CoV-2[36]

1.5 TREATMENT OF COVID-19

Currently, there is no vaccination or antiviral drug for the treatment of human coronavirus. The spike-like glycoproteins present on the surface of coronavirus are important for the development and designing of antiviral drugs. The virus cell receptor interaction plays a major role in the development of potential antiviral drugs for treatment of this pandemic disease. Several common methods are used to find out a potent antiviral treatment for the coronavirus[37]. Firstly, the existing all broad-spectrum antiviral drugs are tested by using standard assay procedures which are used for the treatment of other viral infections. Some of the common drugs which are identified by using this method are interferon I (IFN- alpha, beta, kappa) and interferon II (interferon gamma). These drugs have specific pharmacokinetic and pharmacodynamic characteristics and side effects but these have no anti coronavirus effect[38]. The development of novel specific drug molecules depends upon the biophysical and genome sequence of individual coronaviruses. For example siRNA molecules, enzymes used in the viral replication, mAb targeting host receptor, inhibitors targeting specific viral enzymes involved in the viral replication cycle, mAb targeting host receptor and mAb targeting S1 RBD[39]. Development of these entire new drugs can agree to become clinically useful for the treatment but it takes several years to offer reliable treatment to the patients. According to the guidelines, IFN- alpha and lopinavir/ritonavir are recommended for the treatment of coronavirus. Lopinavir and ritonavir combination have found anti coronavirus activity *in vitro*. For severe acute respiratory syndrome (SARS) patients lopinavir/ritonavir and ribavirin had minor risk of acute respiratory distress or death[40]. Additionally, Fabiravir and ribavirin are nucleoside analogs which have multiple mechanisms of action such as lethal mutagenesis, chain termination and inhibition of nucleotide biosynthesis[41]. Moreover, Ramdevsivir is also a potential drug for the treatment of COVID-19. The animal study showed that the remdesivir has the ability to reduce the virus titer in infected mice and improve lung tissue damage[42]. Chloroquine is an anti-malarial drug which is also used for the treatment of COVID-19. Chloroquine has the ability to inhibit pH-dependent replication of some of the viruses. In addition, it is an autophagy inhibitor and has immunomodulatory effects as well as suppressing the release of IL-6 and TNF-α[43-45].

1.6 Role of heat shock protein in COVID-19 infection

The COVID-19 patients' shows common features like lymphopenia and hyper-inflammatory syndrome known as "cytokine storm" (increase in CRP, IL-6, TNF, IL-1β, MCP1 levels etc.)[46]. The un-controlled release of all these cytokines may increase the chances of septic shock or multiple organ failure. The COVID-19 immuno-pathology still not well discovered, it may involve the inflammatory response and the first inflammatory signal leads to local or systemic increase in temperature. The rise of temperature triggered a response to transcriptional program depend upon the activation of heat shock transcription factor-1 (HSF-1) and *heat shock response* (HSR). The activation of HSF-1 begins the machinery for quick production of the anti-inflammatory/ cytoprotective heat shock proteins (HSP). For example, HSP70 is the most expressed and sensitive heat shock protein which is essential for the protection of cells against non-lethal stresses like

oxidative, exertional, thermal, ischemic and metabolic stress[47].

1.7 Convalescent Plasma therapy for coronavirus

Convalescent plasma therapy is a kind of passive immunotherapy used for the treatment of SARS COV-2 infection. In this plasma is collected via apheresis frequently and in larger volume with little and no impact on the hemoglobin level of the patient's. The convalescent plasma was procured from the individuals who had got well from COVID-19 infection. The COVID-19 infection recovered patient act as a suitable plasma donor for one to two weeks. All donors should be finding testing negative for SARS-CoV-2 RNA, immunoglobulin (IgM) and testing positive for immunoglobulin IgG prior to the donation. The procured plasma may be stored at lower temperature –18°C for further clinical use[48]. Initially a batch of 10 patients of severe COVID-19 infected patients was clinically treated with convalescent plasma therapy (200-mL dose) which carried greater neutralizing titers. In convalescent plasma, the antibody neutralizing titer may vary from 1:12 to 1:512. The antibody neutralizing responses achieved peaked at 4 months and then reduced to untraceable levels in 50% patients at 36 months. In the receivers, the clinical symptoms such as oxy-hemoglobin level and lung lesions was get better within 3 days of transfusion. The transfused convalescent plasma was related to changes in undetectable viral loads. No serious adverse effect only some minor adverse effects have been reported with convalescent plasma transfusions therapy such as temperature increase, itching and skin rash[49].

1.8 Different strategies for the development of coronavirus vaccine

The designing of a vaccine principally depends upon the antigen, adjuvant, manufacturing system and the delivery route. The quick development of vaccines is possible only because of the genome sequence and structural information of the virus (SARS-CoV-2) was available in the record. All the data along with bioinformatic predictions and epitope mapping has gave crucial information about the development of inactivated and live-attenuated vaccines. Nanotechnology also play a great role in design of modern vaccine design for example the mRNA/viral vector vaccines has been delivered via lipid nanoparticles and already reached in Phase III of clinical trials[50-51].In vaccination, different antigen peptides in recombinan/derived form and inactivated pathogenic form are utilized to bring cell-mediated immunity. Therefore, vaccination is the ideal platform to produce body defense mechanism against various infectious and vaccines are also highly selective for the infection as compared to other anti-microbial agents. Moreover, safe and effective vaccination is play crucial role to break away the chain of infection transmission from zoonotic reservoirs and infected individual to vulnerable hosts[52]. Currently, group of researchers have developed few vaccine strategies against novel coronavirus infection which comprised the inactivated, live-attenuated vaccine, protein subunits, viral vector vaccine platforms. The rush in design and development of fast-track coronavirus vaccine may be dangerous. But looking at this critical need, various previous studies on coronavirus vaccine designing /literature has played a significant role to offers a possible clue for the successful delivery of vaccine against COVID-19. The anti-viral vaccines development strategies includes live-attenuated and inactivated vaccine (first generation), protein subunit and vector base vaccine (second generation) and nucleic acid and nano-material vaccine (third generation)[53].Currently, more than 150 projects are under working process for the development of coronavirus vaccine however only 2 dozen has been accepted for clinical trials. In March, the first human clinical trial starts in the United States of America. The Hong Kong-listed Biotech Firm (Can Sino Bio) and the Academy of Military Medical Sciences had also registered for its first human clinical. India is also participating in this for the development of COVID-19 vaccine. For example, Cadila Healthcare LTD., and Bharat Biotech are in the early phase of clinical trial. Bharat Biotech had developed an "inactivated" coronavirus vaccine named as "Covaxin" and for this a strain of the novel Co-V has been isolated by the National Institute of Virology (Pune)[54]. Globally, the current status about the development of coronavirus vaccine shown in table (1).

Table.1 Current status for the development of coronavirus vaccine

Vaccine name /trail number	Type	Target / objective	Clinical status	Developer
NCT04327206	Live attenuated	To determine the impact of BCG vaccination for reduction of COVID-19 severity.	Phase III	Murdoch Children Research Institute, Australia[55]
NCT04328441	Live attenuated	Investigate the effect of BCG vaccination on healthcare workers	Phase III	UMC Utrecht, Netherland[56]
ChAdOx1 nCoV-19	vector vaccine	Full-length S (Gen Bank accession)	Phase II/III	UK, University of Oxford[57]
Ad5	Vector vaccine	Full-length S, based on Wuhan-Hu-1 strain	Phase I	China[58]
mRNA-1273	Lipid nanoparticle (LNP)-encapsulated mRNA-based vaccine	Full-length, prefusion stabilized S	Phase II/III	USA[59]
Ad5	vector vaccine	Full-length S, based on Wuhan-Hu-1 strain	Phase I/II,	Canada[60]
NCT04336410	Nucleic acid	Determine the nucleic acid vaccine against COVID-19	phase I	Inovio Pharmaceuticals, USA[61]
ChiCTR2000031809	Inactivated vaccine	Determination of immunogenicity and safety of inactivated COVID-19	Phase II	Wuhan Institute of Biological Products co., Ltd., China[62]
NCT04383574	Inactivated	To assess safety as well as immunogenicity of inactivated COVID-19 vaccine	Phase I/II	Sinovac Research and Development Co., Ltd., China[63]
NCT04368728	Nucleic acid	Study the safety, immunogenicity and efficiency of RNA vaccine against COVID-19.	phase I/II	Biontech SE[64]
2020-001038-36	Nucleic acid	Study the safety and immunogenicity of vaccines against COVID-19	Phase I/II	BioNTech RNA Pharmaceuticals GmbH [65]

1.9 Various other treatment remedies for coronavirus

Currently, there is no specific treatment for coronavirus infection but some of the common approaches may be used to prevent, control and management of this disease. These approaches are categorized according to healthcare system as Aurvedha, Unani, china and siddha system of treatments. Around, 2500 medicinal plant formulation have been used in

Indian traditional medicine system. Since number medicinal plants showed anti-oxidant, antiviral, antimicrobial and anti-cancer activities. Nonetheless, various clinical trials have to be done to confirm their activities.

1.10 Unani medicines

The Unani systems of medicines are generally plant-based, non-toxic and beneficial without any adverse effects. The various parts of the different plants are eminent for their anti-viral activities. Some of the most famous plants are *Allium cepa, Glycyrrhizaglabra*, *Ocimum sanctum, Allium sativum, Piper nigrum, Ocimumtenuiflorum, Cinnamomumverum, Curcuma longa*, *Daucusmaritimus* etc. All these plants aqueous extract have anti-viral properties and used with honey and lemon juice for the treatment of common cold, flu and virus infection. The Licorice root (*Glycyrrhizaglabra*) are well known for its antiviral potential and mainly found in the Asia and Europe. An in vitro study of *Glycyrrhizaglabra* plant extract reported for their antiviral activities for several viruses such as SARS related respiratory syncytial, HIV-1, and SARS related coronavirus. The research groups reported that this plant extract found to be active against varicella zoster, HIV, hepatitis A, B, C, SARS, cytomegalo virus herpes simplex type-1[66]. In 2015 Wang et al., presented a review on the antimicrobial and antiviral activities of the *Glycyrrhizaglabra and also described* presence of more than 20 tri-terpenoids and 300 flavonoids in this plant which are useful for the treatment of infection. Therefore, an aqueous extract *Glycyrrhizaglabra* plant with other plants was mentioned as useful strategy to control COVID-19 infection. January 29, 2020, the India Government issued an advisory which includes the ways of preventive management and a list of Unani medicines based on traditional medicine system Ayurveda, Homeopathy and Unani, New Delhi[67].

1.11 Homeopathy

The Directorate of AYUSH, New Delhi, India had issued an order to take prophylactic drugs to treat coronavirus infection. The directorate suggested that taking minimum 3-pills of Arsenic Album-30 medicine every day in empty stomach are found to be active against infection. The Arsenic Album-30 is a form of diluted arsenic trioxide and work like homeopathic prophylaxis but there is no evidence regarding the clinically effectiveness of Arsenic Album-30 medicine. Under homeopathy, taking arsenic content at very low concentration is measured valuable for various diseases and viral infections. But researcher and doctors have criticized homeopathy treatment for coronavirus infection and this is called as pseudoscience. Many researchers work on this and reported that it does not work for viral infections. Moreover, the news director Jakkapong Watcharachaijunta of Thailand Medical News channel condemns the use of homeopathic treatment in controlling COVID-19 infection. Whereas, Dr. Robert T. reported that the Arsenicum album medicine was found to be effective for reducing fever, headache, sore throat and runny nose in the patients infected with flu symptoms[66].

1.12 Chinese medicine

A research published in the *Lancet* stated that *liquorice root* which is the frequently used Chinese herb which carrying active chemical constituent glycyrrhizin potentially use to inhibit the replication of clinical isolate SARS virus. TCM is highly appreciated by the China Government in their campaign and around 26 provinces have authoritatively declared that TCM should be utilized in combination with other conventional medicine for the treatment of coronavirus infection. In china more than 50 trails are under study for the treatment of coronavirus patient with TCM and it includes the herbal preparations like *Xin Guan-1 Formula*, *Qing Yi-4* and *Xin Guan-2 Formula.* Some of the commercially TCM products are also studied for their effectiveness such as *LianHua Qing Wen Capsule and Tan Re Qing Injection*. Different herbal medicines are use in TCM system for the treatment of COVID-19 such as Astragalusmembranaceus, Glycyrrhizaeuralensi, Rhizoma, JapinicaeFlos, Fructusforsythiae, Scrophularianingpoensis, Eupatoriihebra and Dendrobiumnobile Lindl[68].

1.13 RT-PCR assay technique

The rapid spreading and increasing number of coronavirus disease 19 (COVID-19) requires the need of rapid and accurate identification of the virus to control the infection and prevent the patients from illness. Because of lots of advancement in medical technology, the nucleic acid detection approaches have become more popular for rapid and accurate viral detection. Amongst the nucleic acid detection test, polymerase chain reaction (PCR) method is known as the 'gold standard' for the identification, sensitivity and specificity of the viruses that cause infection. Currently, the real-time reverse transcriptase-PCR (RTPCR) gaining more interest for the identification of SARS-CoV -2 because of its specificity, simplicity and sensitivity for early diagnosis of infection[69]. Hence, the real-time RT-PCR assay known as a main method for the identification and detection of the causative agent of SARS-CoV-2. But there are some issues with the real-time RT-PCR method because some time it may elicit false-positive and false-negative results. In many studied it is stated that most of the 'suspected' cases with clinical characteristics of COVID-19 and matching specific computed tomography images (CT) were not identified. Therefore, a negative consequence does not eliminate the possibility of COVID19 infection and it should not be considered as only criterion for identification and treatment of patient. That's why the combination of real-time RT-PCR and clinical characteristics facilitates the management of coronavirus outbreak. The False-negative results could be occurred by mutations in the probe and primer target area in the SARS-CoV-2 genome. Various types of real-time RT-PCR kit for SARSCoV-2 have been made and approved quickly. But the main thing to notice that the specificity and sensitivity of the real-time RT-PCR test is not 100%[70].

1.14 CT imaging of coronavirus patient

Till January, 2020 around 4600 cases were and have been reported globally. First 41 patients had reported with the pneumonia symptoms and were analyzed for the chest CT scans. Initially, the CT scans were analyzed for the various characteristics such existence of ground-glass opacities and consolidation, number of lobes influenced by ground glass or consolidative opacities, degree of involvement of lobe as well as overall lung total severity score, presence of nodules and pleural effusion, presence of thoracic lymphadenopathy and presence of lung disease like fibrosis or emphysema[71].

1.15 Central nervous system effect of coronavirus

Human coronaviruses have ability to harm the central nervous system and may be act as a neuroinvasive. Currently the SARS-CoV-2, have been reported with the neurologic manifestations in most of the patients. The related symptoms include olfactory dysfunction, alveolar hypoventilation and respiratory failure which is similar to the "Ondine's curse" of bulbar polio in which the sign of damage of autonomic brainstem centers. In most of the cases, it has been reported that patients with SARS-CoV-2 pulmonary disease shows hypoxia-driven in which respiratory rate increases. The olfactory deformities have been reported as a reflection of peripheral nasopharyngeal without CNS dysfunction. Encephalopathy with the metabolic, severe respiratory and immunologic disturbance of critical illness may relate for non-focal neurologic signs[72].

1.16 Relationship between SARS, MERS and coronavirus

Coronaviruses belongs to the geneus of the family *Coronaviridae* and enveloped viruses with a plus strand Ribonucleic Acid (RNA) genome. Coronaviruses were identified in many species such as rats, mice, chickens, cattle, turkeys, swine, cats, dogs, rabbits and horses cause respiratory and enteric infectious diseases. Coronaviruses, such as HCoV−OC43 and HCoV-229E were identified since the mid-1960s. Earlier to the SARS-CoV epidemic, coronaviruses were only known for the mild, self-limiting respiratory infections generally referred as "colds". SARS-CoV is a type of coronavirus which was occurred in the Guangdong Province of China and identified in 2002. It is the most severe human disease which was caused by coronavirus. The SARS-CoV virus was originated from the mutation of the non-human host, most probably bats and have the ability to affect humans. But in case of SARS-CoV the transmission was not that much efficient. Its spreading occurred only via the direct contact with infected individuals and found negligible infectivity through incubation period. Middle East Respiratory Syndrome-CoV (MERS-CoV) was emerged in 2012 in Saudi Arabia and most of the Middle East countries. In the early stages, the pandemic have high mortality rate but it was highly controlled and didn't accelerate that much during 2013 and in the end of 2014[7,8].In December 2019, various cases of pneumonia were observed in Wuhan (China) and the pathogen that cause pneumonia was identified as a novel RNA β which was known as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). This virus exhibited phylogenetic similarities with both MERS-CoV and SARS-CoV viruses. It is was found to be more similar to bat coronaviruses and postulated that bats may be the main hosts of SARS-CoV-2. The hypothesis recommended that the infection have been transmitting through the wild animals which are sold in the Huanan Seafood Market. The SARS-CoV-2 shows a more competent transmission pattern as compared to the SARS-CoV and MERS-CoV and retaining a very high transmission rate during asymptomatic incubation state. The clinical characteristic of COVID-19 varies from asymptomatic forms to acute bilateral pneumonias and requiring hospitalization. Common symptom includes fever, dry cough, and fatigue whereas laboratory tests often show elevated lactate dehydrogenase level and lymphopenia. The computed tomographic image of chest shows a distinctive pattern of bilateral patchy shadows and ground glass opacity. A cluster of patients which having severe coronavirus infection can experience the ostensible "cytokine storm syndrome", which was characterized through fatal hyper-cytokinemia[3,20].

1.17 BREAK CHAIN THEORY

Here Break chain word means breaks the chain of infection. There are various germs i.e. bacteria, viruses, fungi, and protozoa and infections are found all over the world. Even though a variety of viruses and bacteria, germs transmit from body to body through a common sequence of actions. No matter the germ, there are six links at which the chain can be demolished and a germ can be blocked from infecting others. The six links include: (1) the infectious agent: these are any micro-organisms capable of causing and growing. (2) Reservoir: - a place where micro-organisms occupy, develop and recreate i.e. water, toilet seat, food, environments etc.(3) Portal of exit: A portal of exit is the site from where micro-organisms leaves the reservoir. (4) Means of transmission: The movement of organisms from one to another by direct or indirect contact. (5) Portal of entry: A doorway, entrance where the infectious agent can enter a host's body.(6) Host: Host is a person who is at risk for developing an infection from the disease[45].Chain is nothing but a series of links attached. The way to stop germs from spreading is by breaking the chain at any link. We can break Chains by: cleaning Hands and sanitizing i.e. Hand hygiene is Key, using PPE (Personal protective Equipment) i.e. Masks, Gloves etc., aware on your vaccines, take medicines as directed, Keep your space clean i.e. clean contaminated objects and maintain same, social Distancing or physical distancing, immunization and sterilization, healthy lifestyle and insect control[73]. We can break the infection chain by adopting above mentioned standard precautions and Make Our Society Safe by guiding / teaching to others."Every time each of us follow, teach, guide standard precautions or aware others, an infection is a victory."

1.18 Prevention of spreading of Coronavirus

- Regularly clean hands with alcohol-based hand wash/ soap and water.
- Maintain one meter distance, when someone sneezes, coughs and speaks because they spray small liquid droplets from their mouth and nose that may particles of virus.
- Avoid to going crowded places because at crowded places people come in contact with someone that has COsVID-19 infection.
- Follow good respiratory hygiene that is covering mouth and nose with mask.
- Self isolate and stay home when minor symptoms are appeared such as headache, cough and mild fever until recover.

2. CONCLUSION

The COVID-19 swept across China speedily and also spread to other countries and areas outside the China. The virus transmitted from person to person by direct contact. The most preventative measure to prevent the spreading of infection by some control measures such as find the

suspected patient, virus carriers and block the transmission via isolation and social distancing. Scientists have worked continuously to make vaccines and antiviral drugs against the coronavirus. Time alone will tell us how the virus will impact our lives. The coming time will provide us an enormous new information regarding COVID-19 such as pathogenesis of the microorganism, development of the new anti viral drug molecule and vaccination and allow us to make decisions on this new virus and public health safety as soon as possible.

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3. AUTHORS CONTRIBUTION STATEMENT

Ms. PriyaDhiman Analyzed the data, discussed methodology and result of the final manuscript. MR. AnuragDhiman Gather the data related to the work and necessary inputs regarding the work.

4. CONFLICT OF INTEREST

Conflict of interest declared none.

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