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nCOVID -19 pandemic outbreak in India - A concise review

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Abstract-- The beginning of 2021 has seen outbreaks of novel coronavirus COVID-19 infections, which have become a global pandemic. It is considered to have higher contagiousness and mortality compared to SARS and MERS. Clinical manifestations of nCOVID-19 symptoms are identified as coughs, fevers, vomiting, chills, joint pain, shortness of breath, and diarrhea. Older people over 70 years of age and those with chronic debilitating diseases such as end-stage illness, diabetes mellitus, hypertension, and pulmonary diseases are at a higher risk of mortality from nCOVID-19 infection. Currently, no specific approved antiviral drugs are available against nCOVID-19. Considering this imminent need,

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scientists and physicians have been racing to better understand this new pandemic virus-specific mechanism; pathophysiology, and target site of the disease to find effective therapeutic agents and vaccines. This review summarized the origin, transmission, clinical symptoms, and conventional outcome treatment strategies of infection. It also included a discussion of the potential for recurrence. In our study, we emphasized reported potential repurposing drugs that are effective against SARS, MERS, and nCOVID-19, among other diseases. Our early knowledge will provide an overview of the intelligence basis work for currently existing therapeutic vaccines against nCOVID-19 that will be useful in the development of future vaccines. Preventive interventions and early diagnosis of nCOVID-19 outbreaks should be implemented immediately in order to reduce the disease burden both locally and worldwide.

Keywords--- *nCOVID-19, Pandemic, Prevention, Outbreak, India*

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Introduction

Globally, varieties of unknown virus diseases with origination are still affecting the human environment. The outbreak of nCOVID-19 in India, a new novel coronavirus disease (2019-nCoV) designated as a severe acute respiratory syndrome. nCOVID-19 first emerged from Wuhan, China on Dec 9th, 2019, and WHO on Jan 12th, 2020 named this novel virus as nCoV-2019 and on Feb 11th, 2020 as nCOVID-19. Many websites have been set up to track pandemic case confirmation, mortality, and recovery on an hourly basis. nCOVID -19 has spread to over 150 countries and at present, there are nearly 40,747,420 confirmed cases, 1, 24,480 mortality, and over 30,410,455 recoveries as of October 20th, 2020. nCOVID-19 new cases are suspected and detected in India due to the spread of virus between human to human transmissions, especially by nCOVID-19 affected international air travelers and carriers. In India according to MoHFW, the total numbers of confirmed cases are 7,602,414 of which 115,296 are dead and 6,737,145 cured. In addition to this state-wise confirmed cases are given in Figures 1 A and B (up to October 12th, 2020).

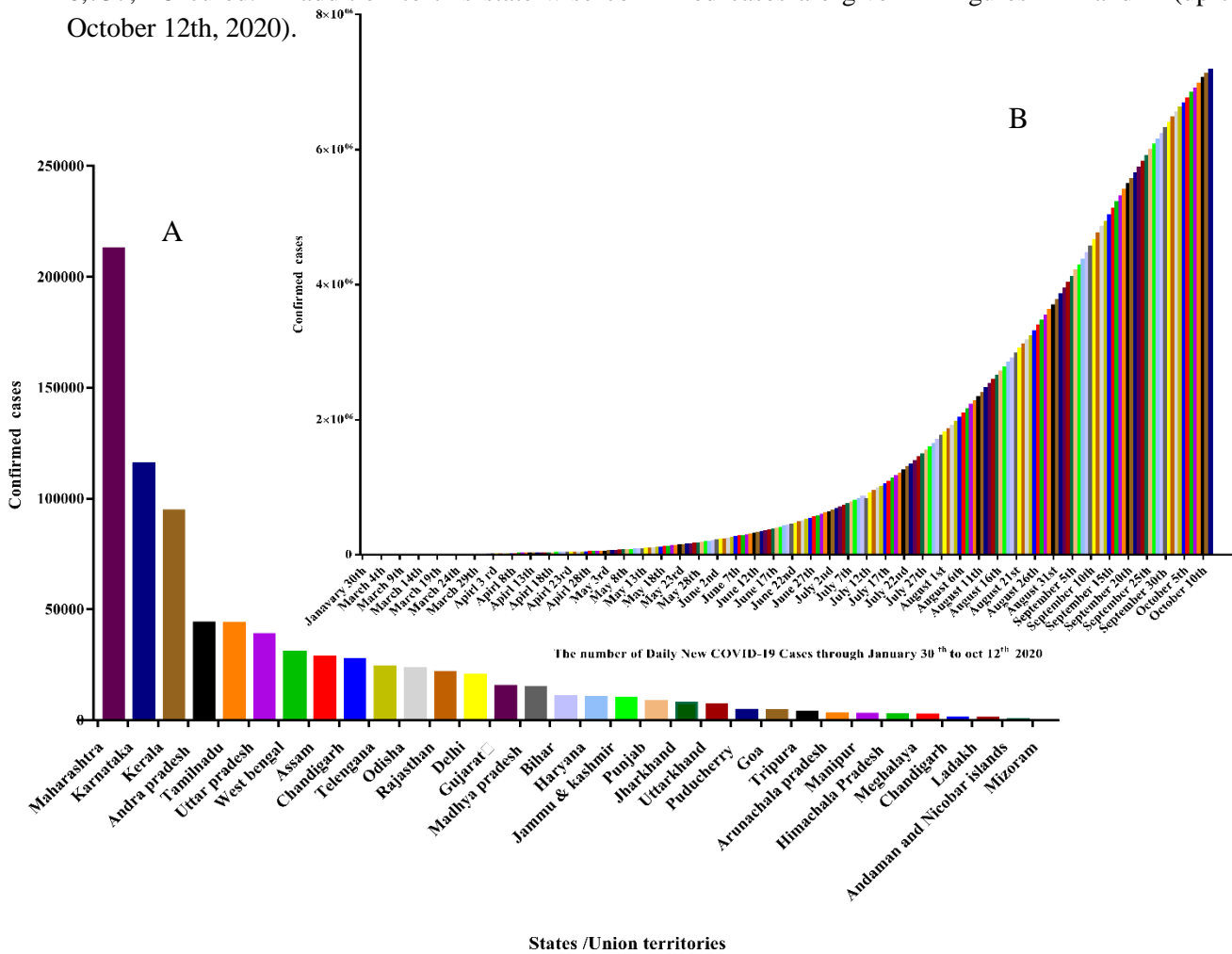


Figure 1 A: Shows the number of nCOVID -19 confirmed cases in India as state wise; B: Shows the daily wise confirmed case from Jan to Oct 12th 2020. Data were illustrated according to ministry of health and family welfare (MoHFW) coronavirus disease daily dashboard.

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Coronavirus, belong to the genus of Coronaviridae family, order Nidovirales, and are relatively large enveloped single standard positive-sense RNA genome virus with 27-32kb in size, capped and polyadenylated within a membrane envelope (figure 2A). These viruses have been spread by mice, rats, pigs, chickens, cats, dogs, cattle, and humans which causes severe infection including respiratory disease and gastroenteritis. After SARS, now current emerging highly pathogenic nCOVID-19 and MERS-CoV are generally spread through the animal to human transmission.

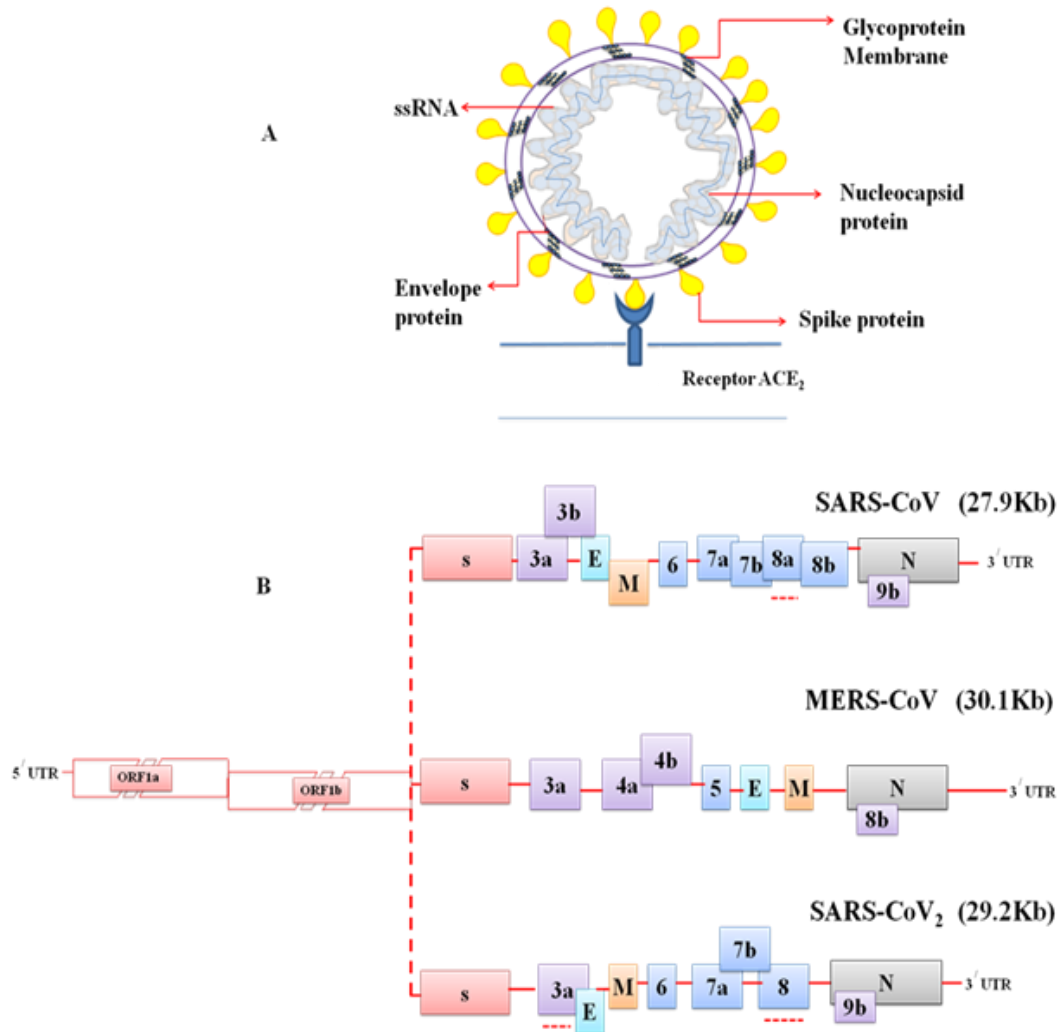


Figure 2: A Shows an illustration of the nCOVID-19 structure and angiotensin-converting enzyme (ACE₂) viral receptor attached to the host surface. B: Illustrated SARS-CoV and MERS-CoV functional S protein domain and genome organization of beta coronavirus. sRNA genome of SARS-CoV, MERS-CoV and nCOVID-19 encodes large two genes ORF 1a, ORF1b, it's 5' and 3' terminal encodes polyproteins which form viral replicase transcriptase complex in structure, Their structural gene encodes Spike (s), Envelope (E), Membrane (M), and Nucleocapsid (N) are common features and contain SSRNA 26-32Kb genome in size. Dotted red-underlined is the protein that shows key variation between SARS-CoV₂ and SARS-CoV

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Our current review focuses on re-emerging pandemic nCOVID-19 coronavirus infections in India and discusses the biological features along with other associated RNA viruses of SARS and MERS with regard to origin, genome, transmission, clinical features, and therapeutic options. Due to its importance in the current scenario, we further illustrated the comparison of the timeline of outbreaks between SARS and nCOVID-19 (figure 3). Our review will focus on nCOVID-19 spillover in India, and discuss the effectiveness of therapeutic repurposing drugs and steps against re-emerging pandemic nCOVID-19 coronavirus infection in humans.

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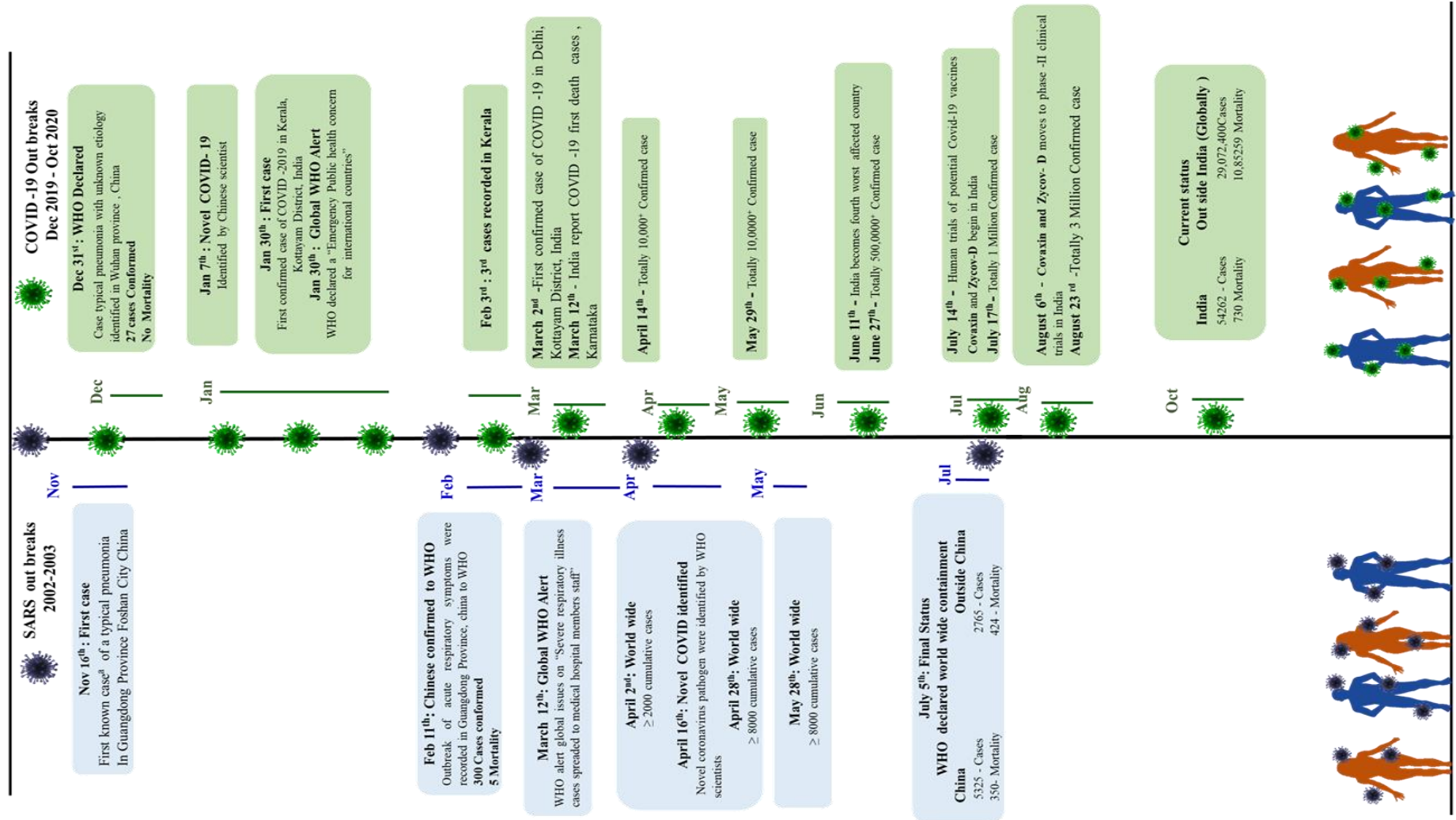


Figure 3: Shows the outbreak time line events of SARS-CoV (Left) and COVID -19 (Right).

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Origin, genome structure and transmission

The origin and transmission source is most important to be determined to develop new conventional preventive strategies for all coronavirus infections. Coronavirus belongs to the genus of Coronaviridae family, order Nidovirales are relatively large single standard positive-sense RNA genome virus 27-32kb in size, capped, and polyadenylated within a membrane envelope (figure 2B). These viruses have been spread by mice, rats, pigs, chickens, cats, dogs, cattle, and humans causing severe infection including respiratory disease and gastroenteritis. In humans, it was not considered as highly pathogenic until recognized to cause acute respiratory syndrome. The three coronavirus of SARS, MERS, and nCOVID-19 were considered as zoonotic infections belonging to the β -coronavirus genus. Other viruses are low endemic to humans which are; HCov-HKU1 (β coronavirus), HCoV-OC43 (β coronavirus), HCoV-229E (α coronavirus and HCoV-NL63 (α coronavirus). For both SARS and nCOVID-19 viruses host receiver was directly originated from bats(1), and the live palm civets cats sold out from animal markets are suspected as intermediate zoonotic transmission host between bats and humans (2,3). In the case of MERS viruses, the host receiver was directly originated from bats to the camel to humans (4,5).

Genome structure

On December 29th, 2019, a clinical report from Wuhan market, china has subsequently identified a bat RATG13CoV positive-sense RNA genomes with 96.2% sequence identical with 79.5% of nCOVID -19 29.2 kb size (6,7) whereas SARS-CoV is 27.9Kb and about 50% are identical to the MERS-CoV 30.1Kb genome sequence (8,9). International virus commission named nCOVID-19 as SARS-Cov₂ and based on its genome sequence analysis, it is similar to SARS-CoV which consists of open reading frames (ORF) and a unique coding strategy (figure 2 B)(10) .The first ORF (ORF a/b) region was positioned on two-third of the viral RNA region, While other remaining ORFs were encoded with two large polyproteins (PP1a, PP1ab) and 16 non-structural proteins (nsp1- nsp16), located on the rough endoplasmic reticulum where the viral transcription and replication occurs (11) . For viral assembly M, E, and the N protein play a major role in RNA synthesis. The S protein meditates invasion of the host cell membrane through a receptor ACE₂ protein in both SARS-Cov and nCOVID -19 (12). MERS-CoV

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promotes DPP4 and act as a functional receptor between human and other organisms (13). Thus virologists, microbiologists, molecular biologists, and epidemiologists need to closely monitor the nCOVID-19 to understand its virulence and also finding and understanding which receptor and specific protein binding of the virus to the host cell will predict the zoonotic transmission to human beings.

Virus Transmission

For both SARS-CoV and nCOVID-19 transmission occurred between human to human, particularly family members, relatives, friends, and neighbors who are intimately in contact with infected victims or carriers and for the MERS-CoV transmission occurs through nosocomial as nasal droplets, besides close contact (14), the consumption of the host animals was suspected in 70% of COVID-19 transmission (15). However recently identified nCOVID-19 cause's life-threatening pneumonia (16, 17), its intermediate host remains debatable whether transmission occurs directly or indirectly through bats or infected humans or through an intermediate host transmission (figure 4). Based on WHO data, nCOVID-19 pathogenicity was 3% lower than that of 10% SARS-CoV and 40% MERS-CoV, in case of transmissions nCOVID-19 shows (RO: 1.4-5.5) higher than of SARS-CoV (RO: 2-5) and MERS-CoV (RO :< 1). To date, no FDA-approved therapeutics and vaccines are available against coronaviruses infection. Nonetheless, to eradicate the coronavirus, virologists and epidemiologists should focus more on the identification of zoonotic intermediate sources that caused the transmission of the virus to humans.

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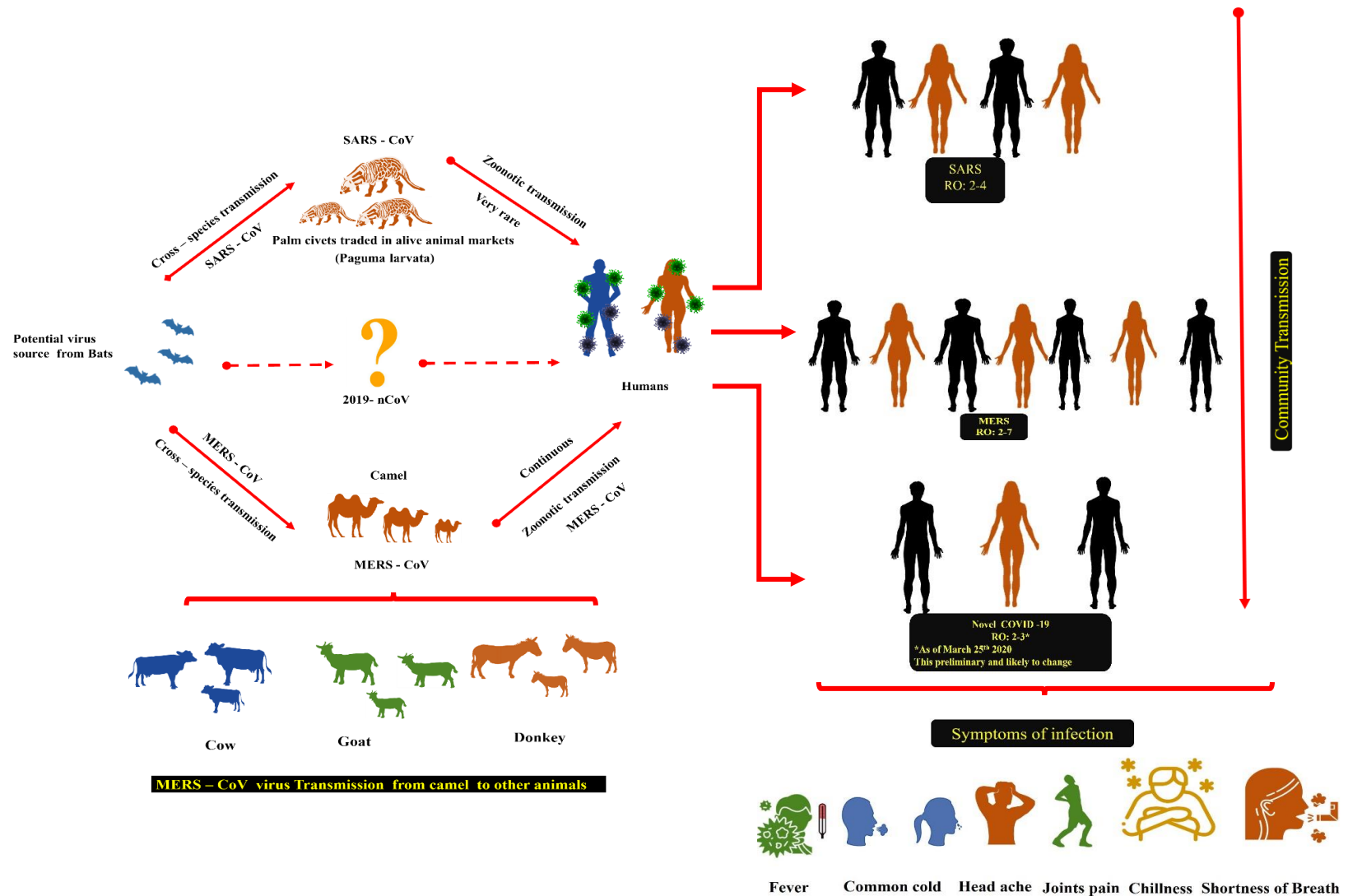


Figure 4: Shows the transmission routes of SARS-CoV, MERS-CoV, nCOVID-19. Intermediate host and suspected transmission were indicated in question marks and broken red lines. Figures show outline path sketch of Virus transmission occurs from infected camel to human to various animals and animals to human transmissions via through population

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Characteristics of coronaviruses

The characteristics of nCOVID-19, SARS-CoV, and MERS-CoV are remarkably similar in victim's infections, although there are subtle differences detailed in Table 1. Currently, mechanisms of nCOVID-19 human pathogenesis are poorly understood and it is probably similar to the MERS-CoV mechanism (18). In infected victims, nCOVID-19 causes asymptomatic to severe respiratory illness (13). Patients with symptomatic coronaviruses had complications as lower, upper respiratory illness, Central nervous, Cardiovascular, and gastrointestinal symptoms. The major clinical characteristics of nCOVID-19 symptoms are fever, Chillness, generalized myalgia, malaise, drowsiness, and confusion. Mild symptomatic cases are manifested by low fever, sore throat, running nose, joint pain, and muscle ache (19). In critical cases, gastrointestinal symptoms of vomiting, diarrhea, nausea, pain in abdominal and renal failure features are common and the severe infection progresses to the acute lower respiratory syndrome (20). Chest X- rays are more common symptoms with nCOVID- 19 affected patients (60-100%) (21,22) particularly among males and aged people compared to MERS-CoV (23,24). Poor outcome is seen among nCOVID-19 and MERS-Cov patients with diabetes mellitus, cancer, hypertension, kidney and lung diseases (21, 25). Besides pneumonia was observed to be mildly due to concurrent bacterial infection in victims (23,24,26). Other findings are an increase in white blood cells, particularly neutrophils, and a decrease in red blood cells, platelets, and lymphocytes in confirmed victims (27).

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Table 1: Shows the general characteristics of SARS-CoV, MERS-CoV and nCOVID-19

Characteristics	SARS-CoV	MERS-CoV	nCOVID-19
Biological characteristics (6,7)			
Virus	Single standard RNA	Single standard RNA	Single standard RNA
Origin	Bats, Civet cats	Bats, camels, other animals like cow, goat and donkey	Bats, Civet cats
Transmission	Nosocomial and Zoonotic Transmission*, human to human through fomites, Aerosol droplets and physical contact	Nosocomial, respiratory and Zoonotic Transmission* and Aerosol droplets	Nosocomial, respiratory, Airbone and Zoonotic Transmission* and Aerosol droplets through human to humans
Dominance	Both male and female	Only male	Both male and female
Age of infected individuals	50 - 65 years	45 -50 years	60 - 80 years
Incubation periods	One week	One week	Two weeks
Spread mode	Average	little	peak
Incidence	During (Dec- Jan) winter season	During (May- July) summer season	During (Dec- Jan) winter season
Clinical characteristics (8–10)			
Head ache	Mild	Mild	Mild
Joint Pain	Mild	Mild	Mild

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Fever	Moderate	Moderate	Moderate
Chillness/Rigors	Moderate	Moderate	Moderate
Malaise	Mild	Mild	Mild
Generalized Myalgia	Moderate	Moderate	Moderate
Drowsy	Mild	Mild	Mild
Confusion stage	Mild	Mild	Mild
Blood characteristics (11–13)			
Red blood cells counts	Decreases	Decreases	Decreases
White blood cells counts	Increases	Increases	Increases
Platelets counts	Decreases	Decreases	Decreases
Lymphocytes Counts	Decreases	Decreases	Decreases
Fatality range over all	10.80%	35.80%	3.10%
Pulmonary Characteristics (11,12,14)			
Cough	Moderate	Moderate	Moderate
Shortness of breath	Moderate	Moderate	Moderate
Abdominal pain	Mild	Mild	Mild
Nausea and Vomiting	Mild	Mild	Mild
Dyspnea	Mild	Mild	Mild
Diarrhea	Mild	Mild	Mild
Pneumonia	Severe	Severe	Severe

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Hemoptysis	Mild	Mild	Mild
Acute Renal failure	Severe	Severe	Severe

Zoonotic Transmission* Animal to Human; Human to Human communities

Clinical features

Clinical features are determined based on their epidemiological data and primary examination of lower and upper respiratory illnesses. However, the diagnosis of nCOVID-19, SARS-CoV, and MERS-CoV patient’s symptoms of with or without fever, should be by both clinical suspicion and epidemiologic link (28,29). Once nCOVID-19 is suspected or confirmed, clinical specimens of blood, sputum, nasal secretions, bronchoalveolar lavage, tracheal aspirate, an oropharyngeal or nasopharyngeal swab are collected from infected patients for RT-PCR analysis or Northern blot hybridization for targeting the specific nCOVID-19 genes³⁰. The conventional screening methods of SARS-CoV, MERS-CoV, and nCOVID-19 by molecular confirmation approach are summarized in table 2. Molecular approach confirmation by rRT-PCR for SARS-CoV, MERS-CoV, and nCOVID-19 requires two positive target sites namely genomic target or detection site, and secondly sequence confirmation site (figure 5). Currently for the target assay screening upstream region of upE is recommended, and for the confirmation assay ORF1a, ORF1b, and N gene are commonly used by clinicians (30). In hospitalized patients, repeat testing of samples from serum, lower and upper respiratory tract is highly recommended by RT-PCR analysis (30). Lower respiratory tract specimens within 7 days after onset of symptoms appear to have better diagnostic sensitivity for early diagnosis of nCOVID-19 among patients with symptoms for 14 days or longer, serologic testing is recommended for nCOVID-19 specific antibodies of IG/IGF by ELISA kit. Another method of nCOVID-19 diagnoses is by chest CT scan for lung involvement, many clinicians suggested CT scan as a more sensitive and effective method for diagnosis (31). Combination of rRT- PCR and CT chest scan is better for the nCOVID-19 diagnosis when rRT-PCR screening is negative. High resolutions CT (HRCT) is recommended for the early diagnosis of disease severity in SARS-CoV₂ (31). Currently, ELISA kits and IgM/IgG of POCT for nCOVID-19 have been developed and detected higher nucleic

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acid detection rates and their sensitivity of IgM/IgG test for nCOVID-19 remains unclear and requires further evaluation. To successfully overcome the diagnostic problem and decrease the risk of the nCOVID-19 outbreak, ICMR has approved a list of multidisciplinary testing laboratories all over India.

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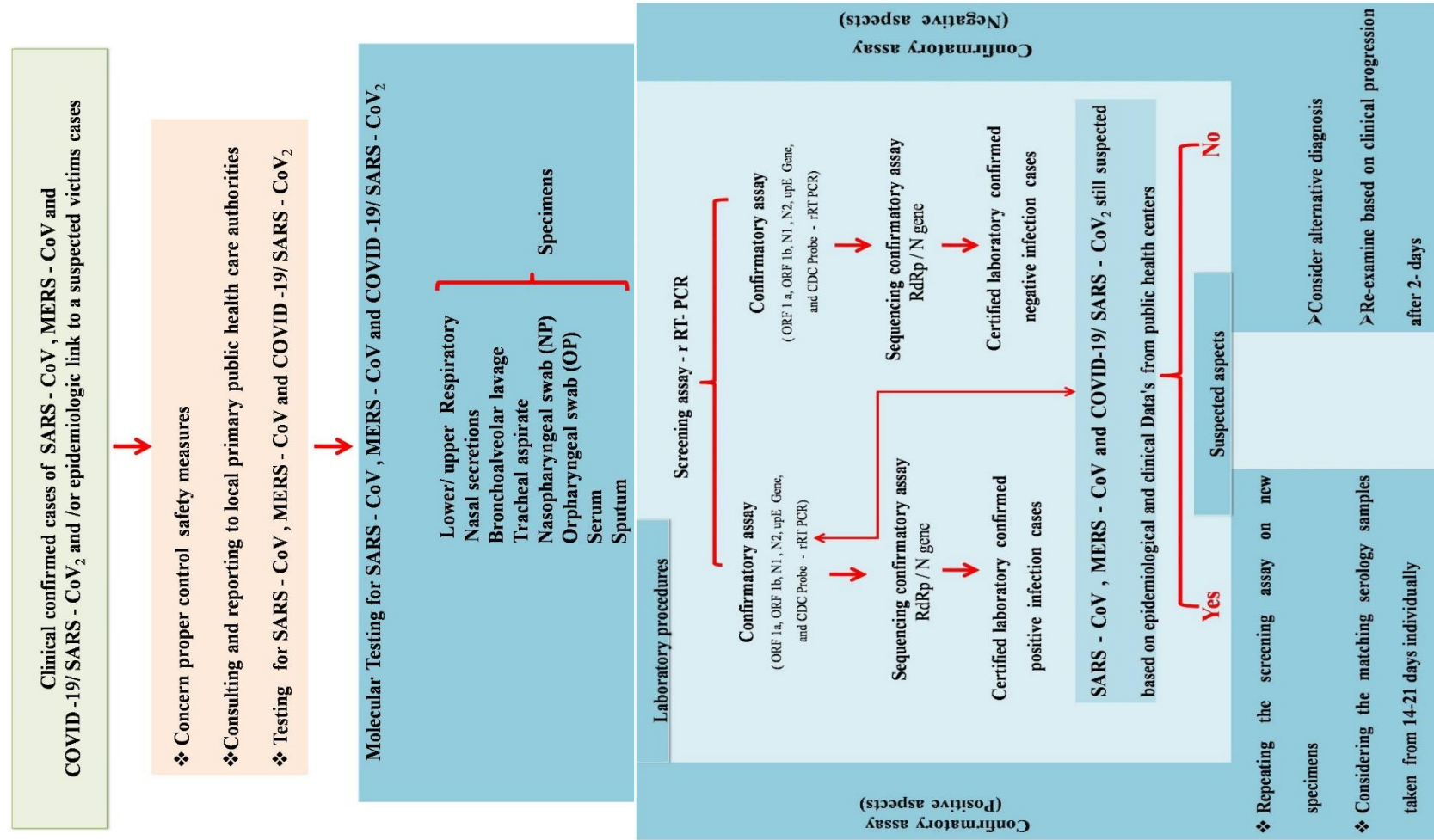


Figure 5: Shows the illustration diagnostic route line approach for SARS-Cov, MERS-CoV, and COVID-19. Clinically confirmed cases are based on the symptoms and presence of an epidemiological link to known infections patients

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Table. 2: Conventional method strategies available for molecular testing of SARS-CoV, MERS-CoV and nCOVID-19 virus

Gene Target (Region)	Genome Target	Instrumentation Assay	References
(N2)	Nucleocapsid gene	Real Time RT-PCR Screening	(15)
(upE)	Non - coding region upstream of envelope gene		(16)
(N3)	Nucleocapsid gene	Confirmatory by conventional Real Time RT- PCR	(15)
(ORF) 1 a	Transcriptase replicase complex		(16)
(ORF) 1b	Transcriptase replicase complex		
(N) Nucleocapsidgene	Nucleocapsid gene	Confirmatory assay by sequencing method	
(RdRp)	Transcriptase replicase complex		

(N, N2, N3) Nucleocapsid gene, (upE) Upstream of envelope gene, (ORF) open reading frame, (RdRp) RNA-dependent RNA polymerase

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Recent conventional treatment strategies

To date, there are no clinically proven effective antiviral drugs available for SARS-CoV, MERS-CoV, and nCOVID-19 (8, 32). Concurrently many strategies are being considered to treat nCOVID-19, including oxygen therapy, use of antibiotics for secondary infection, inhibitors of the inflammatory response, antiviral drugs, corticosteroids, and convalescent plasma, etc as shown in table 3(33). Infected individuals without symptoms need only supportively care in the same way treatment for SARS-CoV, MERS-CoV, and nCOVID-19 are not understood so far (8, 32). Besides MERS-CoV treatment are usually started late at the preliminary stage, was treated with antiviral drugs showed very low effects.

Existing antiviral drugs with potential applications

For nCOVID-19 their therapeutic vaccines are needed to be identified for reducing its transmission, severity and to control the outbreak worldwide. Several strategies were established and implemented against coronavirus. Vaccines using clinically tested cell lines, animal inactivated virus, live attenuated virus, recombinant DNA, and protein are being tried (35). nCOVID-19 vaccine development is still in progress and may take months to years. Currently, many promising existing antiviral drugs are being tested for nCOVID-19 infection and their clinical effectiveness is analyzed. World health organization jointly with several expert scientists to give more than eighty clinical trials on nCOVID-19 potential treatment globally. Only a few existing antiviral drugs along with a combination of HIV drugs and some pharmaceuticals drugs seem to have an effect against nCOVID-19 other existing antiviral drugs are also listed in Table 4 along with the mechanism of action and potential therapeutic use in nCOVID-19 infection. Remdesivir has been found to be the most promising antiviral drugs against SARS-CoV, MERS-CoV, nCOVID-19 (36). Moreover, United States of America, Washington health department personnel administered Remdesivir drug and found it useful in treating nCOVID-19 infections (37).

Currently, Remdesivir is under clinical trial and undergoing evaluation for intravenous use and safety in patients with nCOVID-19 infection (38). This drug is in the Phase III clinical trial now both in the USA and China. The combination of ribavirin with corticosteroids and other antiviral drugs showed a good anti-inflammatory effect against nCOVID-19 infection in humans (39, 40). Ribavirin drug shown side effects of anemia in

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patients and its antiviral activity against nCOVID-19 is uncertain⁴¹. Similarly, Oral oseltamivir antiviral drug has been used for the nCOVID-19 treatment⁴² but its efficacy remains unclear. Nucleoside analogs drugs such as ribavirin, galidesivir and favipiravir (T-705) are clinically effective against nCOVID-19 influenza (8, 32). nCOVID-19 are effective against IFNs, were as *invitro* conditions of MERS-CoV are found to be potent inhibitors of the replication and effects on patients are still need to prove. In *invitro* conditions, IFNs effectiveness was increased by the addition of ribavirin. But it reduces disease severity in MERS-CoV with improved survival of infected patients. IFN α inhalation atomizations are also recommended as antiviral therapy for nCOVID-19. A combination of IFN α -2b anti-HCV inhibitors (33), their findings are also initiated for the treatment of nCOVID -19 (43-47). The anti-malarial known drug chloroquines were found to act against nCOVID-19 and their clinical efficacy studies are now being done as an open-label drug. (ChiCTR2000029609) (48–50). In *invitro* condition, a combination of chloroquine with remdesivir is demonstrated to inhibit nCOVID-19 (51); Besides, Chloroquine was reported as strong inhibitor for SARS by interference with ACE2. Corticosteroids were also used for the treatment of SARS-CoV, MERS-CoV to suppress the cytokine levels in victims (43, 47). So far there is no clear clinical evidence of reducing mortality (52, 53) and they are not still recommended to diagnose nCOVID-19. Meanwhile, Convalescent plasma patient's antibody therapies were suggested to treat nCOVID-19 as followed as SARS-CoV (52), MERS-CoV (54). Convalescent plasma therapy showed a promising efficacy against nCOVID-19 infection in China, but their safety measures are not yet evaluated. The Protease inhibitor drugs used for HIV infection treatment, when combined with ribavirin showed a better outcomes in SARS-CoV patients when compared with single-dose ribavirin alone. Similarly also reported that the combination of lopinavir/ritonavir with ribavirin shows better outcome compared with a single dose of lopinavir against MERS-CoV infections. In South Korea, the study carried by Kim et al showed triple-drug combinations of lopinavir /ritonavir, ribavirin with IFN α 2A resulted in successful recovery among the case of MERS -CoV infection. In the case of nCOVID-19 triple-drug combination is considered as an early stage therapy. Clinically used drugs such as chloroquine, cyclosporine, chlorpromazine, loperamide also used to inhibit the replication process of SARS-CoV and MERS-CoV(44) while their mechanism action is still not reported (55-59).

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Table 3: Shows recent conventional treatment strategies for SARS-CoV, MERS-CoV, and nCOVID-19 infections

Therapeutic agent	Types of treatment	References	
Non-invasive mechanical ventilation	Oxygen therapy	(17)	
Mechanical ventilation (Invasive)			
Nasal cannula			
Extra corporeal membrane oxygenation (ECMO)			
Lopinavir/ Ritonavir	Antiviral drugs	(17,18)	
Ribavirin		(17,19)	
Favipiravir (T-705)		(20)	
Remdesivir		(21,22)	
Oseltamivir		(23)	
Arbidol		(24)	
Chloroquine/hydroxychloroquine		(20)	
Interferon		(23,24)	
Cyclosporine A			
Intravenous gamma globulin		(24)	
Amoxicillin		Antibiotics Combination	(17)
Azithromycin			
Fluoroquinolones			
Methylprednisolone	Corticosteroids	(23)	
Convalescent plasma	Convalescent plasma	(24)	

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Table 4: Shows the notable potential existing antiviral drugs approved by WHO for SARS-CoV and nCOVID-19 treatment

Drug	Mechanism of action on SARS-CoV and COVID-19	Drug target	Disease caution
Lopinavir^a	Protease Inhibitors that may Inhibit and bind to M ^{pro} ; PL ^{pro} OR 3CL ^{pro} , and suppress the corona virus activity	Viral proteases: PL ^{pro} or 3CL ^{pro}	HIV protease inhibitor drug for HIV infection, SARS-CoV, MERS-CoV, COVID -19 infection
Ritonavir^c			
Ribavirin^a	Inhibits the viral RNA and protein synthesis	RdRp	Hepatitis C, RSV infection, hemorrhagic viral fever
Favipiravir (T-705)	It inhibits the viral RNA polymerase replication interaction ^a	RdRp	Virals infection
Remdesivir^a	Its nucleotide analogue inhibit the RNA polymerase and stop viral replication process ^a	RdRp	Viral infections of SARS-CoV, MERS-CoV, nCOVID -19, Ebola infection
Arbidol^a	Its inhibitor disrupts binding of viral envelope protein to host cells and prevent the entry to cell	S protein/ACE ₂ ^d	Influenza viruses
Chloroquine / HydroxyChloroquine	It elevate endosomal pH and interfere in ACE ₂ glycosylation process ^a	Endosome/ ACE ₂	nCOVID -19, Malaria parasite infection
Barticitinib	JAK inhibitor interfere in inflammatory processes	JAK kinase	Autoimmune disease (Rheumatoid arthritis)
Nitazoxanide	Inhibit viral protein expression	N/A	Viral infection of Helminthic , protozoa
Galidesivir^b	Inhibits the viral replication by interacting with RNA polymerase	RdRp	Hepatitis C, Marburg, Ebola, Zika virus infections
Azithromycin	Drug may inhibit pulmonary inflammatory disorders, reduce the excessive cytokine production associated with viral infections	IL-8 / Blocking the nuclear transcription factors	Bacterial infection ; nCOVID -19 infection
Tocilizumab	Inhibit IL-6 signaling receptors	IL-6	Rheumatoid arthritis, nCOVID -19 infection

^a nCOVID -19 clinical trial testing ^(68,69)

^bVirus induced diseases – clinical trial under process^(3,70,71.)

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^c Ritonavir drug – Pharmacokinetic enhancer, used with combination of antiviral lopinavir drug (25,26) ^d Its is an viral inhibitor ,its mechanism action on S protein and ACE2 on host cell are need to understand ⁽⁷⁴⁻⁷⁶⁾

Conclusions and Future Perspective

Currently, the novel COVID -19 coronavirus is spreading and its incidence was increasing nationally and worldwide. Because of globalization, coronaviruses outbreaks will occur with different multi mutant strains in upcoming years. It seems to be pandemic and more contagious with a higher mortality rate compared to other viruses of SARS and MERS disorders. In our review provides information on nCOVID -19 outbreaks worldwide, especially outbreaks in India and we also summarized the currently available repurposing agents effective against the nCOVID-19. Currently, due to the high pandemic situation of nCOVID-19, India must follow some tactics strategy method to develop so many therapeutic drugs and vaccines and also by increasing vaccination units in primary health care centers and hospital in all over districts and also creating so many advertisements on public health awareness program, preventive measures, and collaborating with medical doctors and the scientific committee will help to improve the pandemic situation under control. Recently, the Indian Government has taken preventive measures on enacting full lockdown, supporting and accelerating diagnosis by providing PCR-fluorescent probe kits and adequate treatment facilities for symptomatic patients. Scientifically to step forward, developing the transgenic zebrafish and mice model against nCOVID-19 infection will help the scientist and researchers to overcome the mechanism action of the virus. The currently established models and testing methods are not promising and beneficial to patients due to the nCOVID-19 virus pathogenesis. In the future improvement of treatment against coronavirus should be focused on human testing and tracking. Even though treatment is being implemented and evaluated, in the future quarantine with a rapid diagnosis of disease will be a great impact on the outbreak. Until now no promising treatment or prevention strategies have been developed against human coronaviruses. From the current perspective of the outbreak, developing an effective vaccine and therapeutic agent against the emerging nCOVID-19 is yet another great challenge for the virologist and scientists. . Although, existing repurposing antiviral agents showed some activity to inhibit nCOVID-19 replication *invitro* conditions, developing a new vaccine against coronavirus will be the ultimate treatment strategy for re-emerging nCOVID-19 infection locally and globally.

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Statement of Data Availability

The datasets included in this study are available upon request from the corresponding author.

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